



# **IMAGING DICOM GATEWAY USER MANUAL**

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Department of Veterans Affairs  
System Design and Development  
VistA Imaging



# Preface

This is a draft of the user guide for the VistA Imaging DICOM Gateway. The purpose of this document is to help users understand the operation of the VistA Imaging DICOM Gateway and to assist them in their daily tasks.

## Revision History

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## **Revision History**

Additional cosmetic updates reflecting shift to Caché made throughout manual. E. deMoel, A. McFarren.

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BRIT	Brit Systems, Dallas, TX
Caché	InterSystems, Corp., Cambridge, MA
Cemax-Icon	Cemax-Icon, a Kodak Company, Fremont, CA
CT/i	General Electric Medical Systems, Milwaukee, WI
DICOM	National Electrical Manufacturers Association, Rosslyn, VA
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GEMS	General Electric Medical Systems, Milwaukee, WI
ImageShare	DeJarnette Research Systems, Towson, MD
Lumisys 75	Lumisys, Inc., Sunnyvale, CA
MediShare	DeJarnette Research Systems, Towson, MD
OEC C-Arm	OEC Medical Systems, Inc., Salt Lake City, UT
PACS Broker	Mitra Imaging Inc., Waterloo, Ontario Canada (owned by Agfa)
Siemens	Siemens, Iselin, NJ
TARGA, TGA	Truevision, Inc. Indianapolis, IN
VistA	U.S. Department of Veterans Affairs
Windows 2000, XP, etc.	Microsoft, Redmont, WA

All patient and provider names, as well as all IP addresses used in example scripts are fictional.

**(end of Section)**

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# Chapter 1 Introduction

## 1.1 The System: VistA Imaging

The VistA Imaging System is an extension to the VistA hospital information system that captures clinical images, scanned documents, and other non-textual data files and makes them part of the patient's electronic medical record. Image and text data are provided in an integrated fashion that facilitates the clinician's task of correlating the data and making patient care decisions in a timely and accurate manner. The system serves as a tool to aid communication and consultation among physicians — whether in the same department, in different services, or at different sites.

A hospital imaging system can be implemented at one time or incrementally over a period of time. Even if equipment is purchased and installed at one time, it is best to gradually add users and service functionality to the system. It takes time for the IRM staff to be trained and gain experience in how to support imaging technology. It takes time for the initial users of the system to become comfortable enough with the applications to use them during procedures and conferences. Devices within services will need to be connected to workstations to allow image capture. Clinical advocates are very helpful in bringing together clinical image users and IRM staff to implement the capture of new image types. This is an exciting and rewarding endeavor, but does require effort on the part of IRM.

**Note:** All equipment for use with the VistA Imaging system must be tested by the VistA imaging project team for compatibility, reliability, and safe operation. See the VistA Imaging Planning Document (<http://vaww.va.gov/imaging/Planning.pdf>) for the current list of approved items. This is a requirement set by the VA and the FDA.

**Attention: The Food and Drug Administration classifies the VistA Imaging DICOM Gateway as a medical device. As such, it may not be changed in any way. Modifications to the software or database may result in an adulterated medical device under 21CFR820, the use of which is considered to be a violation of US Federal Statutes.**

## 1.2 The VistA Imaging DICOM Gateway

**DICOM** is the abbreviation for the **D**igital **I**maging and **C**ommunications in **M**edicine standard. DICOM brings open systems technology to the medical imaging marketplace and enables VistA to communicate directly with commercial medical imaging equipment.

The VistA Imaging DICOM Gateway is a suite of VA-developed software that facilitates the transmission of DICOM images between the image acquisition modalities<sup>1</sup> and the equipment on which these images are permanently stored. The images and information about them are stored in the VistA database as a part of the patient record. Once images have been stored in the system, they are available for viewing from any VistA clinical or diagnostic workstation.

The software in the VistA Imaging DICOM Gateway is intended to run on one or more PCs that are loosely coupled to the VistA Hospital Information system. Several functions of this Gateway operate automatically without any user intervention. Other functions of this Gateway are controlled by the user through a series of menus.

The later chapters in this manual will describe the various menu-options as well as any additional set-up and fine-tuning features of the VistA Imaging DICOM Gateway.

The menu-tree for the current version of the VistA Imaging DICOM Gateway is shown at the end of this chapter.

### **1.3 Installation of the VistA Imaging DICOM Gateway**

The installation procedure for the VistA Imaging DICOM Gateway is described in the VistA Imaging DICOM Gateway Installation Guide.

The Installation Guide contains a concise set of instructions that depict an initial installation, as well as a detailed set of instructions that describe all tuning parameters that pertain to the VistA Imaging DICOM Gateway.

### **1.4 How to Get Software and Documentation Updates**

This software will be available in the Imaging FTP directory under your site's folder. Installation instructions are included in this document.

#### Terms of Use:

FDA regulations require that each Imaging software distribution is documented and tracked by the VistA Imaging project. To receive this patch, sites must have a Site Agreement filed with and approved by the VistA Imaging Group.

For information concerning the status of a Site Agreement contact the VistA Imaging Distribution Manager via email (Kathy.Trombetta@med.va.gov) or phone (301-734-0357).

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<sup>1</sup> The term “modality” is from the DICOM standard and denotes any equipment that produces images.



## 1.5 Documentation Conventions

The following conventions are used in this manual.

Convention	Description
<b>Bold type</b>	User Keyboard Entry
<Enter>	Return key or Enter key
<Control-x>	A keystroke that involves pressing the control-key, keeping it depressed, and then pressing another key.
<SHIFT>	Shift key
<ESC>	Escape key

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## 1.6 VistA Imaging DICOM Gateway Menu

1. Text Gateway
  - 1.1. Start Processing Text Messages from HIS
  - 1.2. Send DICOM Text Messages to Commercial PACS or Broker
  - 1.3. Display Text Gateway Statistics
  - 1.4. Display Modality Worklist Statistics
  - 1.5. Modality Worklist Query
  - 1.6. Display a HL7 Message
  - 1.7. Display a DICOM Message
  - 1.8. Modify the HL7 Message Pointer
  - 1.9. Generate a Daily Summary Report
  - 1.10. Purge Old Modality Worklist Entries
  - 1.11. Purge Old DICOM Message Files
  - 1.12. Purge Old HL7 Transaction Global Nodes
  - 1.13. Purge Old Audit Records
2. Image Gateway
  - 2.1. Receive PACS Exam Complete Messages
  - 2.2. Send PACS Request Image Transfer Messages
  - 2.3. Process DICOM Images
  - 2.4. Increment DICOM Image Input Pointer
  - 2.5. Display Real-Time Storage Server Statistics
  - 2.6. Display Cumulative Storage Server Statistics
  - 2.7. Display Daily Image Processing Statistics
  - 2.8. Send DICOM Images to Another Storage Server
    - 2.8.1. Select DICOM Images for Transmission
    - 2.8.2. Transmit DICOM Images to a Storage SCP
    - 2.8.3. Stop Image Transmission Queue Processor
    - 2.8.4. (Re)Initialize Image Transmission Queue
  - 2.9. Display a DICOM Image Header
  - 2.10. Re-Transmit Images from PACS
    - 2.10.1. Start Querying in PACS
    - 2.10.2. Stop Querying in PACS
    - 2.10.3. Maintain Set-Up Parameters
3. Routing Gateway
  - 3.1. Start the Transmission Processor
  - 3.2. Stop the Transmission Processor
  - 3.3. Start the Evaluation Processor
  - 3.4. Stop the Evaluation Processor
  - 3.5. Import Routing Rules
  - 3.6. Purge all Completed Entries in the Transmission Queue
  - 3.7. Purge Completed and Expired Entries in the Transmission Queue
  - 3.8. Re-Queue all Failed Entries in the Transmission Queue
  - 3.9. Remove Obsolete Entries from Transmission Queue
  - 3.10. Display Routing Rules
4. System Maintenance
  - 4.1. System Operation
    - 4.1.1. Display MUMPS-to-MUMPS Broker Status
    - 4.1.2. Display DICOM Message Log
    - 4.1.3. Issue a DICOM Echo Request
    - 4.1.4. Display the Version of the Software
    - 4.1.5. Display Gateway Application Usage Statistics
    - 4.1.6. Support Telephone Numbers
    - 4.1.7. Shut Down this System
  - 4.2. Gateway Configuration and DICOM Master Files
    - 4.2.1. Display Gateway Configuration Parameters
    - 4.2.2. Update Gateway Configuration Parameters
    - 4.2.3. Update INSTRUMENT.DIC
    - 4.2.4. Update MODALITY.DIC
    - 4.2.5. Update PORTLIST.DIC
    - 4.2.6. Update SCU\_LIST.DIC
    - 4.2.7. Update WORKLIST.DIC
    - 4.2.8. Reinitialize All the DICOM Master Files
    - 4.2.9. Create Shortcuts for Instruments
    - 4.2.10. Validate Access/Verify Codes for Modality Worklist
  - 4.3. MUMPS Utilities
    - 4.3.1. Access MUMPS Error Log
    - 4.3.2. Global Variable Lister
    - 4.3.3. Display MUMPS System Status
    - 4.3.4. Check Available Space in MUMPS Database
    - 4.3.5. Check Available Disk Space
    - 4.3.6. Display License Expiration Date
  - 4.4. Enter Programmer Mode
5. Quit

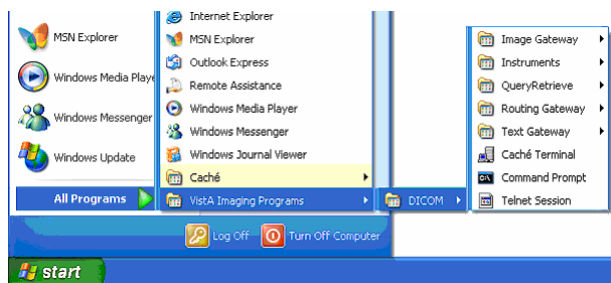
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## Chapter 2 General Operation

The VistA Imaging DICOM Gateway runs on Windows-based workstation as a set of tasks within a Caché™ Server system. To operate the system, the Caché Server needs to be running first. The various subtasks of the VistA Imaging DICOM Gateway then run either invisibly in the background or as telnet sessions connected to the Caché Server process.

### 2.1 VistA Imaging DICOM Menu

The installation should have added a number of programs to the Windows Start menu.



Follow the various menu trees to view all menu options that are made available.

The sections below describe the various application programs in detail.

### 2.2 High-Level Overview of Components of the VistA Imaging DICOM Gateway

The following section will familiarize the user with some of the software components of the VistA Imaging DICOM Gateway.

#### 2.2.1 Caché Cube

The Caché server can be controlled using the “Caché Cube”. The icon for this purpose is located in the “system tray” of the Windows Menu Bar, usually in the lower right-hand corner of the display.

When Caché is inactive, this icon is grey:



When Caché is active, this icon is blue:



This icon can be used to start and stop the Caché server. Under normal circumstances, the Caché server is started automatically when the computer is restarted, and users only need to stop and restart Caché when this is needed for maintenance purposes.

### 2.2.2 Caché Terminal



The icon labeled “Caché Terminal” (and all similar ones) can be used to start telnet sessions with the Caché Server. The various applications of the VistA Imaging DICOM Gateway are all run as terminal-like telnet sessions.

### 2.2.3 VistA DICOM Viewer



The icon labeled “VistA DICOM Viewer” can be used to launch a program that may be used to view images directly on the PC.

### 2.2.4 VistA DICOM Storage Provider



The icon labeled “CT Scanner” is used to launch the VistA DICOM Storage provider that is used to acquire images directly from the device. There is one of these icons for each DICOM device sending images to VistA, and each spawns its own Storage Service provider. See Chapter 4 for details.

### 2.2.5 Command Prompt



or

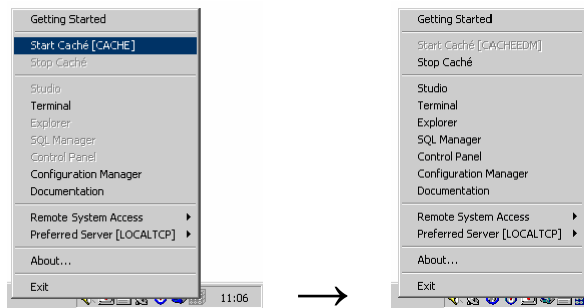


The icon labeled “Command Prompt” provides easy access to an MS-DOS<sup>TM</sup> command window. Such windows are used to interact directly with the operating system.

## 2.3 Starting the Caché Server

The first step in the operation of any component of the VistA Imaging DICOM Gateway is to start the MUMPS Server (Caché Server). Once this program has been started, it should continue to run, until it is explicitly shut down (see Section 6.2.7).

Right-click on the icon for the Caché Cube. This action will cause a menu to appear that can be used to manipulate the Caché system, in this case to start Caché. Select **Start Caché**:



**Note:** Once Caché is started, the icon will change color from grey to blue, and the selection of available menu options will change.

## 2.4 VistA Gateway Main Menu

When a telnet session is initiated after Caché is started, a window will pop up that shows the VistA Imaging DICOM Gateway login dialog.

```
*****
**  VistA DICOM Interface                               Caché Test System  **
**                                                                 **
**  The Food and Drug Administration classifies this software as a medical **
**  device.  Modification of this software may result in an adulterated   **
**  medical device, the use of which is considered to be a violation of    **
**  US Federal Statutes.  Federal law restricts this device to use by or  **
**  on the order of either a licensed practitioner or persons lawfully     **
**  engaged in the manufacture, support, or distribution of the product.   **
**                                                                 **
**  The information in this system is further protected by the Privacy Act  **
**  of 1974 (PL93-579).  Unauthorized access to or use of this system is a **
**  serious violation of Federal Law.  Violators will be prosecuted.      **
**                                                                 **
**                               Use of this software is monitored.         **
*****
ACCESS CODE:
VERIFY CODE:
```

In order to login into a DICOM Gateway, a user can choose between a number of different access and verify codes.

1. The access and verify codes that were entered as part of the installation procedure are to be used for maintenance on the DICOM Gateway itself. When interaction with the VistA

Hospital Information System is required, a different combination of access and verify code is required

2. When a user needs to interact with the VistA Hospital Information System, a combination of access and verify code must be used that is valid on the VistA system (these codes cannot be maintained or modified on the DICOM Gateway and should be set up on the VistA system using Kernel User Management menu options). Such a combination of access and verify code will identify the end-user as a valid user of the VistA system, and the user will have the privileges that the VistA system assigns to the owner of the specified access and verify codes.

Each DICOM Gateway is associated with a “location” (see 6.3.2.2). When an end-user uses credentials that are to be validated on the VistA system, the DICOM Gateway will attempt to set the “current division” such that it corresponds to the “location” of the DICOM Gateway. Access to the DICOM Gateway is only granted when the VistA system acknowledges that the specified credentials give access to that “division” or “location”.

The procedure to modify “access code” and/or “verify code” is, for obvious reasons, protected by a password of its own. See Chapter 8 for a description of this procedure.

When a valid “access code” and “verify code” have been entered, the main menu will appear:

**VistA DICOM Gateway Menu**

- 1 Text Gateway
- 2 Image Gateway
- 3 Routing Gateway
- 4 System Maintenance
- 5 Exit

OPTION:

The later chapters in this manual will describe the functions of the various sub-systems in detail.

## **2.5 Directory Path Conventions**

It is strongly recommended that rather than support separate copies of the dictionary files on each gateway system, the site should maintain a single copy of the DICOM dictionary files in a **\DICOM\Dict** directory on a network drive, from which it can be accessed by all the systems.

In this document, the **\DICOM\data1** and **\DICOM\Image\_in** directories are shown as being on the **d:** local drive. Also for illustrative purposes, the **\DICOM\Dict** directory is placed on the **f:** networked drive, where it is shared by multiple gateways. Please note that a specific site’s configuration may use different drive letters for these directories.



## Chapter 3 Text Gateway

The general function of the Text Gateway is to distribute event data from the VistA Hospital Information System to image acquisition modalities and Picture Archiving and Communication Systems (PACS).

This event data is used to build the database that supports the DICOM Modality Worklist service. The various modalities have the capability to use this service to obtain information about their respective outstanding orders.

Two different methodologies are used in the VistA Imaging DICOM Gateway to handle the text files. For Modality Worklist, a single process performs both the TCP/IP communications and the message handling. An entirely different technique is used for messages sent to a commercial PACS. In this case, separate processes perform the communications and message handling chores, and prioritized messages queues are used to ensure reliable delivery to multiple destinations. The details of these different methods are described in Chapter 9.

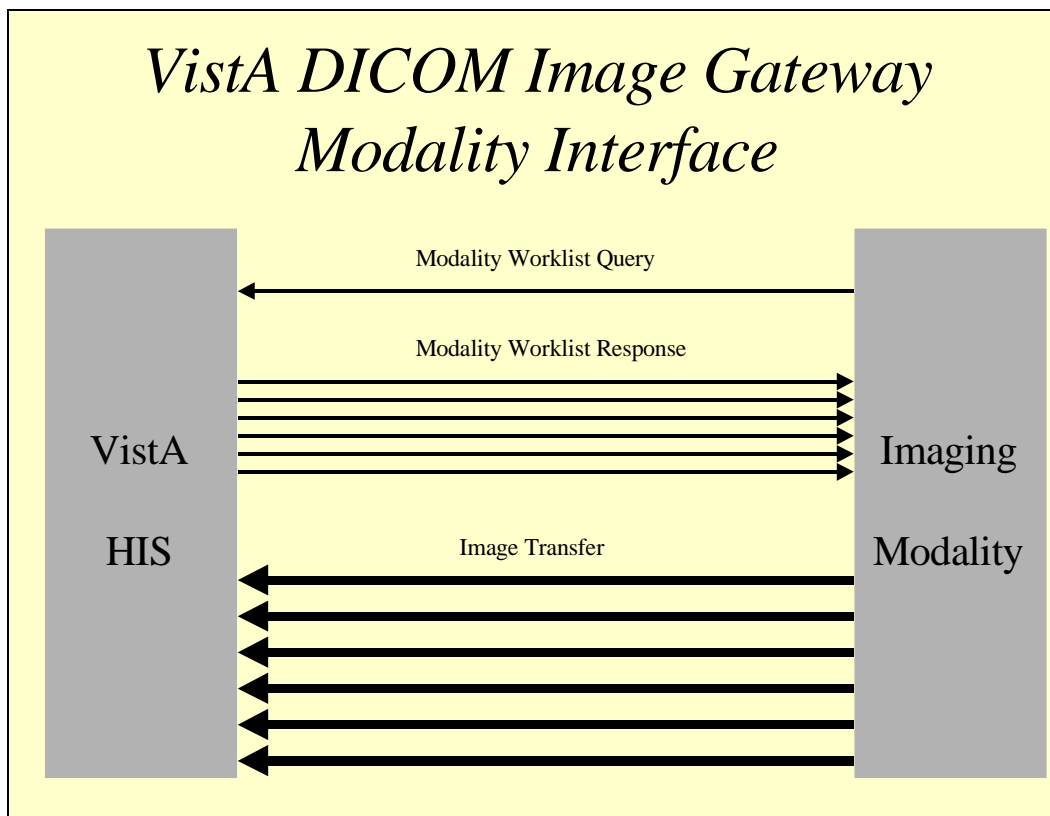
### 3.1 DICOM Modality Worklist

Modality Worklist is the DICOM service that allows an image acquisition instrument, like a CT scanner, to query a provider system, connected to a hospital information system, to obtain a list of examinations that are to be performed at that unit. The modality worklist query precedes the acquisition of the images so that the electronically obtained data can be copied to the header of each image. Modality Worklist eliminates the manual entry of patient and study data at the acquisition workstation. Typically at least six pieces of information are returned in a modality worklist query: patient name, patient ID (social security number), accession number (for example, the radiology date case number in mmddyy-nnnn format), procedure name, and date of procedure, and Study Instance UID (See Figure 3.1 below). All new DICOM image acquisition devices are required by the VA to support the Modality Worklist service to automatically download selected patient and study information.

There are a variety of different ways for a user (image acquisition instrument) to query a provider of the DICOM Modality Worklist service. The user may ask for the entire list of examinations that can be performed at that unit, or may use the accession number to select just the study of interest. Both are useful, one to get a “heads up” to see how much work there is to do, and the other to “drill down” to get specific detailed information about a particular study. Querying for the entire list of examinations and providing a “pick list” gives too many choices to the technologist and has proven to be error prone in practice. Generally, the accession number query is preferred when dealing with individual examinations, since it gives feedback about the particular case and presents the technologist with the smallest number of possible choices. (See Section 3.9 below for examples of Modality Worklist queries.)

VistA is a provider of the DICOM Modality Worklist service (this service can also be supplied commercially by a Mitra Broker or a DeJarnette MediShare, but these must be purchased separately).

The VistA Modality Worklist Provider originally worked with just radiology devices. DICOM capabilities outside of radiology are now supported in CONSULT/REQUEST TRACKING/CPRS for the healthcare providers in the clinical specialties.



### 3.1.1 DICOM Modality Worklist for Radiology

Two events in the radiology department are used to add and delete entries from the VistA Modality Worklist database (maintained on the VistA Text Gateway). The “registration of the patient” in the radiology department triggers the sending of the “Order Entry” HL7 message to the VistA Text Gateway, which adds the study to the VistA Modality Worklist database. At the completion of the examination, the “case edit” of the study in the radiology department, performed by the technologist after verifying that all the images can be displayed on VistA, triggers sending of the “Exam Verification” HL7 message to the VistA Text Gateway. This message causes the study to be deleted from the VistA Modality Worklist database.

While a study is in the VistA Modality Worklist database, it can easily be accessed with an accession number query using the short case number (that is, without the leading date component). When a study is not in the Modality Worklist database, it can be accessed with an accession number query using the date case number (that is, with the leading date component). In this situation, the main hospital system database is used to lookup the study. This capability is very useful when digitizing film for prior studies.

In the VistA Modality Worklist database, the acquisition instruments are mapped to the radiology studies by physical location and Image Type (radiology package parameter). This means that for a consolidated site, each radiology location is subdivided into general radiology, CT's, MRI's, and so forth. When a query for the entire list of examinations is received, only the subset of cases for that specific site and Image Type are sent back to the acquisition instrument.

Some studies are performed on more than one acquisition instrument, for example a “Barium Enema” which has one procedure step that is performed on a general x-ray (computed radiography (CR) or digital radiography (DX)) device and another that is performed via digital radio fluoroscopy (RF). In order to direct the studies to the specific instruments, the entry in the RAD/NUC MED PROCEDURE file (#71), stored in ^RAMIS ( 71 ), needs to be mapped to the RAD MODALITY DEFINED TERMS file (#73.1), stored in ^RAMIS ( 73 . 1 ). The entry for Barium Enema would need to be mapped to both CR (or DX) and RF, in this example.

Some studies span several days, with multiple examinations (for example, nuclear medicine). A report may be entered after the first examination, causing the entry in the VistA Modality Worklist database to be deleted. In this situation, the accession number query with the date case number (that is mmddyy-nnnnn) should be used on subsequent days to retrieve the patient information for the same study.

### 3.1.2 DICOM Modality Worklist for the Healthcare Providers

The Consult Request Tracking application is used in the clinical specialties for order entry, request tracking, and result reporting. The VistA Appointment Management package (which is separate from CPRS) is used for scheduling clinic visits. The following steps are performed for both consult and procedure requests:

- 1) The clinician enters an order for a consultation or a procedure.
- 2) The consult service gets notified about the request.
- 3) The consult service may accept the request with notification sent back to the patient's clinician.
  - a. Alternatively, the consult service may forward the request to a different service; or
  - b. The consult service can discontinue or cancel the request.
- 4) The consult service schedules an appointment for the patient.
- 5) The consult service checks the patient in when the patient arrives for the appointment.
- 6) The consult service performs the consultation and/or procedure(s) and enters the results.
  - a. Image acquisition devices and result reporting systems may be used in this process.
- 7) The consult service signs the final result, completing the request; results are sent back to patient's primary care provider.
- 8) The consult service checks the patient out, thus completing the visit and recording billing codes.

The DICOM interface for Healthcare Providers meshes seamlessly with the existing workflow and integrates with the HIS applications that are in use by the clinical specialties and with VistA Imaging.

In order to provide the greatest flexibility for different workflow scenarios, the interface is designed to operate entirely from the Consult Request Tracking messages. Many of the Consult Request Tracking steps can be omitted. All of the appointment management messages are completely optional.

VistA DICOM Modality Worklist interface receives information from the CPRS Consult/Procedure Request Tracking application and the VistA Appointment Management package during various steps of the workflow. The ordering, accepting, scheduling, check-in, and result entry steps in the workflow are used to create and update the Modality Worklist database, while the completion steps cause entries to be deleted.

A broad modality worklist query produces a list for all the pending and scheduled consults and procedures for that clinical specialty. The DICOM Text Gateway also supports patient or accession number query, which may be more useful.

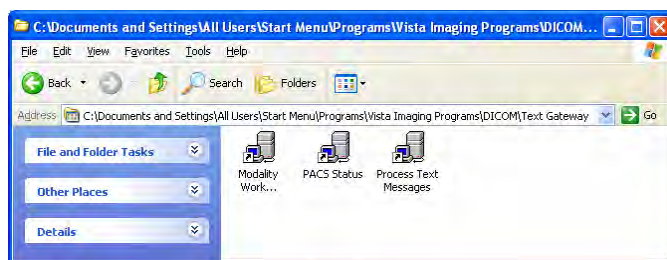
The VA HIS supports a “Quick PID” alternate patient identification scheme. This is a hash index, which uses an abbreviated identifier consisting of the first letter of the last name followed by the last four digits of the social security number (for example, K1234). This value is then used in either the Patient Name or Patient ID matching key to retrieve all of the consult/procedure requests for the patient.

The accession number identifies the consult/procedure and is displayed on the CPRS screen with the request. This value can be used in either the Accession Number or Requested Procedure ID matching key to retrieve the specific request.

**Note:** See Chapter 14 - VistA DICOM Interface for Healthcare Providers Operation for detailed information.

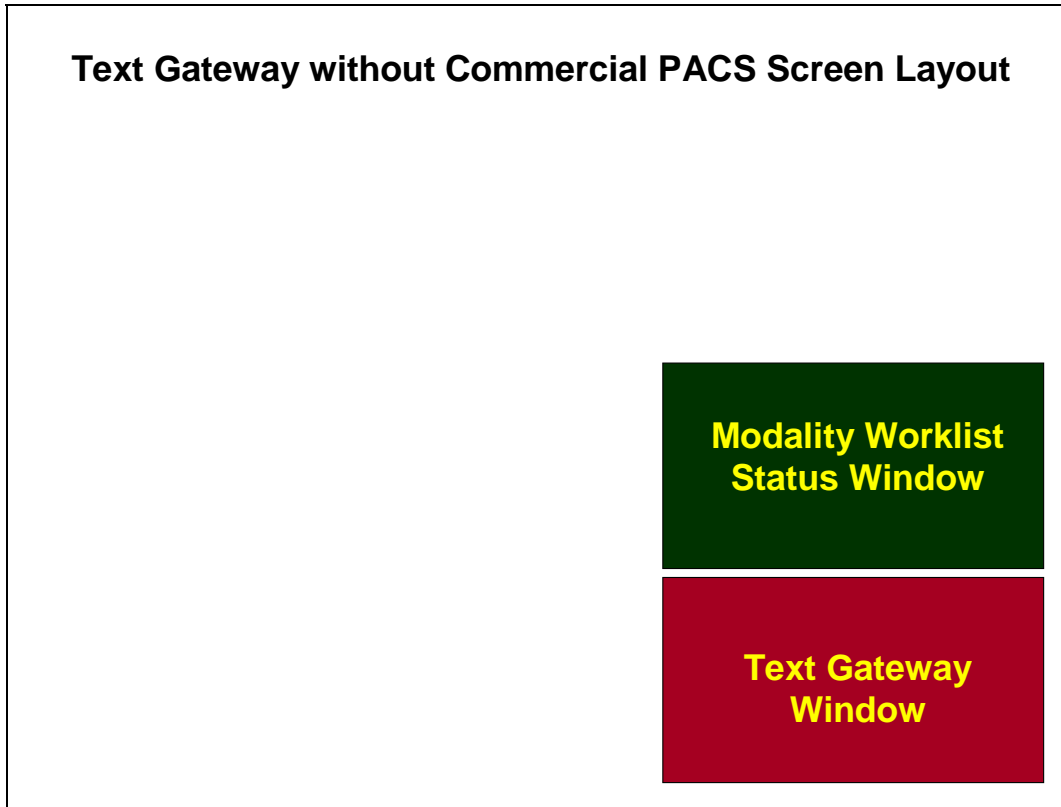
### 3.2 Text Gateway Folder Icons and Screen Layouts

The directory window for the Text Gateway contains the icons shown below. A site may add some site-specific icons, corresponding to the kind of activities at the site.

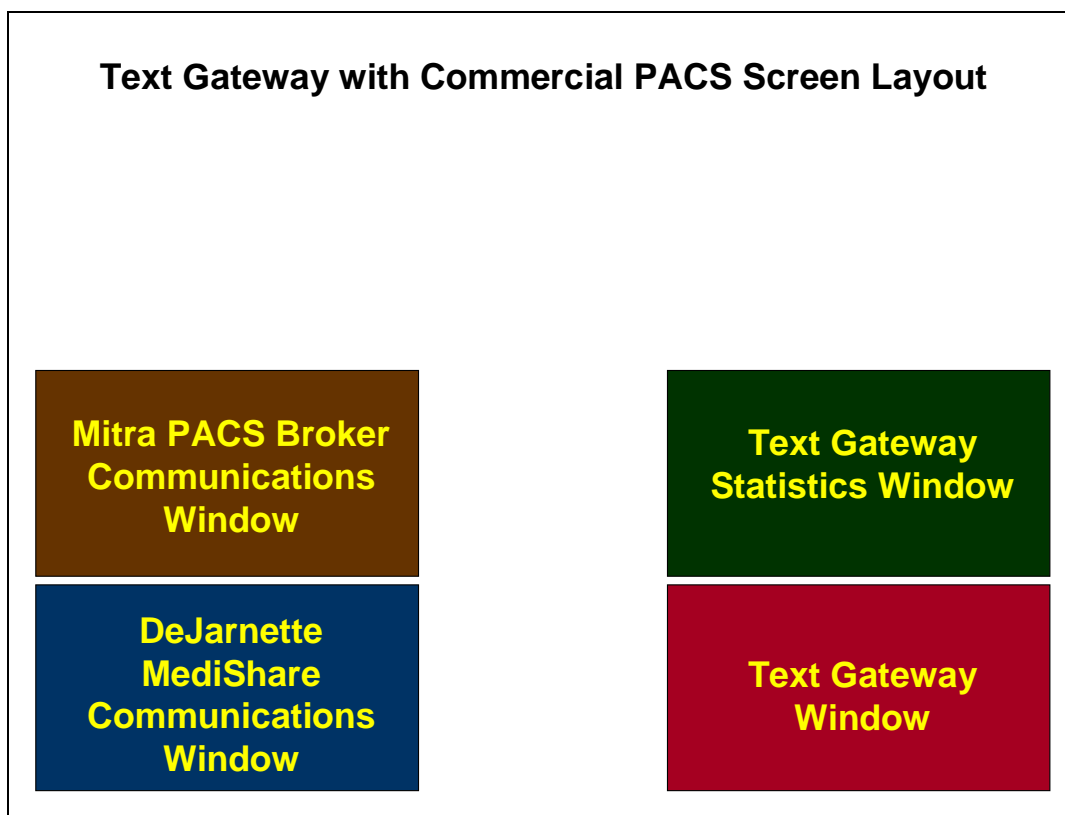


The following figures show how to allocate screen real estate for all the different DICOM Text Gateway processes running on the desktop.

The figure below illustrates the typical screen layout when there is no commercial PACS, and the Text Gateway functions solely as a DICOM Modality Worklist Provider.



The next figure shows a screen layout where there is a commercial PACS (using the Mitra PACS Broker) and a separate commercial Modality Worklist Provider (the DeJarnette MediShare).



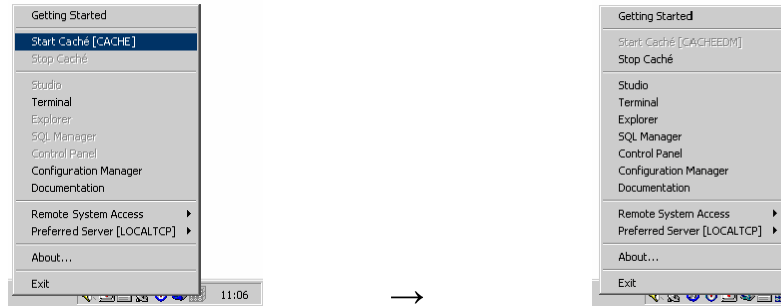
**Note:** This figure is for screen layout illustration purposes only, and represents what is used at a few older sites. There may no longer be any need for a separate commercial Modality Worklist Provider (i.e., the DeJarnette MediShare or Mitra Modality Worklist products), since this service can be supplied by the VistA DICOM Text Gateway.

**Note:** Some modalities use the Mitra Broker internally

### 3.3 Starting the Caché Server

The first step in the operation of any component of the VistA Imaging DICOM Gateway is to start the MUMPS Server (Caché Server). Once this program has been started, it should continue to run, until it is explicitly “shut down” (see Section 6.2.7).

Right-click on the icon for the Caché Cube. This action will cause a menu to appear that can be used to manipulate the Caché system, in this case to start Caché. Select **Start Caché**:



**Note:** Once Caché is started, the icon will change color from grey to blue, and the selection of available menu options will change.

### 3.4 Text Gateway Menu

The menu-options for the Text Gateway software are:

1. Start Processing Text Messages from HIS
2. Send DICOM Text Messages to Commercial PACS or Broker
3. Display Text Gateway Statistics
4. Display Modality Worklist Statistics
5. Modality Worklist Query
6. Display a HL7 Message
7. Display a DICOM Message
8. Modify the HL7 Message Pointer
9. Generate a Daily Summary Report
10. Purge Old Modality Worklist Entries
11. Purge Old DICOM Message Files
12. Purge Old HL7 Transaction Global Nodes
13. Purge Old Audit Records

**Note:** Caché must be running for any of these menu options to be used.

### 3.5 Start Processing Text Messages from HIS

The VistA DICOM Text interface receives HL7 messages from the main hospital system, obtains additional data from the main database, and builds the DICOM Modality Worklist database. If a commercial PACS is present, it converts the HL7 message to a DICOM text message, stores it in a file, and then sends it to the commercial PACS.

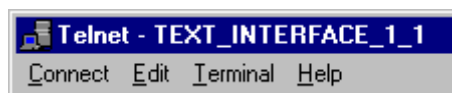
This menu option starts the procedure to read the HL7 messages, build the DICOM Modality Worklist database, and create the DICOM text messages. The sending of these messages is handled by another process.

Within the folder for DICOM Text Gateway, there is a special icon for this menu-option. These special icons are created automatically during the installation process. (For a detailed description

of these icons, their function as “shortcuts”, and the values of their parameters, see the VistA Imaging DICOM Gateway Installation Guide.)



This icon in the DICOM Text Gateway folder will start a Telnet session with the Caché server. When the user double-clicks on this icon, a telnet window will pop up. The title bar of this window will contain the following text:



A convention throughout the VistA Imaging DICOM Gateway is to use the titles of the telnet windows to specify the name of the task and the sequence numbers of the associated menu-options. In this case, the title is “Text\_Interface\_1\_1”. The task name is “Text Interface” and the user selects menu option 1 and then submenu option 1 as follows:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #1 (Start Processing Text Messages from HIS).

Once processing of text messages has been started, it will continue until the VistA Imaging DICOM Gateway is shut down. If the processing of HL7 messages needs to be terminated or suspended temporarily, this program may be interrupted by typing **Control-C**.

The nature of the processing for this menu-option will vary slightly, depending upon whether the system is configured with or without a PACS (and/or broker), as described next.

### 3.5.1 Configuration with a Commercial PACS and/or Broker

The messages exchanged with a commercial PACS or broker are shown in the table below:

Real World Event	Direction	Detached VA SOP Class & Event Type
Patient Demographic Change	VistA →PACS	Patient Management, Patient Updated
ADT	VistA →PACS	Visit Management, Visit Updated
Order Entry	VistA →PACS	Study Management, Study Created
Exam Change (cancel)	VistA →PACS	Study Management, Study Updated
Exam Verification	VistA →PACS	Study Management, Study Updated
Exam Complete †	PACS→ VistA	N-CREATE of the Study Component Management
Get Image Request †	VistA →PACS	C-MOVE request of Query/Retrieve
Get Image Data †	PACS→ VistA	MAG_C-STORE of Storage Service
Get Image Response†	PACS→ VistA	C-MOVE response of Query/Retrieve



Real World Event	Direction	Detached VA SOP Class & Event Type
Report Transfer	VistA →PACS	Interpretation Management/Update

† VistA DICOM Image Gateway with commercial PACS

**Note:** Messages for the DICOM Interface for Healthcare Providers will not be sent to a commercial PACS.

When the local system is configured so that commercial PACS and/or Mitra broker is present, all messages from the HIS will be processed, creating files stored in the First In First Out (FIFO) message queues on the gateway (see Section 3.11). All these messages will be listed in the log. The user will first be asked if ready to begin processing as follows:

Ready to process HL7 messages and send them to the PACS? y// <Enter> yes

```
*****
***  PACS Gateway Process Started on MAY 25, 1999 at 13:21:49  ***
*****
```

```
Tue 13:21 D:\DICOM\Data1\U00000\U0000000 -- EXAM CHANGE -- HL7(461405)
Tue 13:21 D:\DICOM\Data1\U00000\U0000001 -- ORDER ENTRY -- HL7(461406)
Tue 13:21 D:\DICOM\Data1\U00000\U0000002 -- EXAM VERIFICATION -- HL7(461407)
Tue 13:21 D:\DICOM\Data1\W00000\W0000000 -- ADT ADMIT -- HL7(461408)
. . .
```

```
Tue 14:17 D:\DICOM\Data1\W00027\W0002738 -- ADT TRANSFER -- HL7(466632)\
```

### 3.5.2 Configuration without a Commercial PACS or Broker

When the local system is configured so that no commercial PACS or broker is present, only the messages from the HIS related to updating the Modality Worklist database will be processed, and the log will look as follows:

Ready to process HL7 messages and send them to the PACS? y// <Enter> yes

```
*****
***  PACS Gateway Process Started on JUN 07, 1999 at 13:16:06  ***
*****
```

```
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466601)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466602)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466603)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466605)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466606)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466607)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466608)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466609)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466610)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466611)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466612)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466613)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466614)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466617)
```

```

Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466618)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466619)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466620)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466622)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466623)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466624)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466625)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466626)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466627)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466628)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466629)
Mon 13:16 Update Modality Worklist -- ORDER ENTRY -- HL7(466630)
Mon 13:16 Update Modality Worklist -- EXAM VERIFICATION -- HL7(466631)\

```

### 3.6 Send DICOM Text Messages to Commercial PACS or Broker

This menu option sends previously created DICOM files (see Section 3.5.1) to a commercial PACS and/or Broker.

**Note:** If there is no commercial PACS or Broker, this option is not used.

Within the folder for the Text Gateway, there are special icons for each external system that receives DICOM messages. This list of external systems is defined in the master file named **F:\DICOM\Dict\PortList.DIC**.

The icon could look like one of these:



Each of these icons with their associated menu options will start the transmission of DICOM messages from the VistA Imaging DICOM Gateway to the external system, such as a PACS or an information broker.

When the user double-clicks on this icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #2 (Send DICOM Text Messages to Commercial PACS or Broker).
3. Within the program for that menu-option, select destination #1 (PACS Interface).

When the “PACS INTERFACE” menu-option is started, a list of “TCP/IP Port Applications” is displayed, and the user is prompted to select the destination.

The list of “TCP/IP Port Applications” that is presented is defined in the master file named **F:\DICOM\Dict\PortList.DIC**.

DICOM TCP/IP Port Applications

```

1  PACS INTERFACE ----- Port #60040
2  PERRY POINT CR ----- Port #60041
3  FT. HOWARD CR ----- Port #60042

```

OPTION: 1

Beginning communications with the PACS INTERFACE

Ready to transfer DICOM messages via TCP/IP? y// <Enter> yes

```

*****
***  Provider Process (Job #7) Started on OCT 25, 1999 at 07:28:17  ***
*****

```

Socket Available on Port 60041

```

*****
***  Connection with 11.22.33.40,IS~BROKER on OCT 25, 1999 at 07:29:16  ***
*****

```

Recving PDU Type: 01H (A-ASSOCIATE-RQ) PDU len=486  
D:\DICOM\Data1\LOGIMA.007\INCOMING.PDU

```

*****
***  Receiving A-ASSOCIATE-REQUEST on OCT 25, 1999 at 07:29:16  ***
*****

```

```

PDU Type: 01H (A-ASSOCIATE-RQ)                               Length=486
Version=1   Called AE: "VARIS"                               Calling AE: "BROKER"
ITEM Type: 10H (Application Context Item)                     Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item)                     Length=46
Presentation Context ID: 1      Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item)                   Length=17
Presentation Context: 1.2.840.10008.1.1 (Verification SOP Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                   Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item)                     Length=53
Presentation Context ID: 3      Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item)                   Length=24
Presentation Context: 1.2.840.113754.3.1.2.1.1 (VA Detached Patient Management SOP
Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                   Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item)                     Length=53
Presentation Context ID: 5      Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item)                   Length=24

```

```

Presentation Context: 1.2.840.113754.3.1.2.2.1 (VA Detached Visit Management SOP
Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item) Length=53
Presentation Context ID: 7 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=24
Presentation Context: 1.2.840.113754.3.1.2.3.1 (VA Detached Study Management SOP
Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item) Length=53
Presentation Context ID: 9 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=24
Presentation Context: 1.2.840.113754.3.1.2.5.1 (VA Detached Results Management SOP
Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item) Length=53
Presentation Context ID: 11 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=24
Presentation Context: 1.2.840.113754.3.1.2.6.1 (VA Detached Interpretation Management
SOP Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=54
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 100000
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=18
Implementation Class: 1.2.124.113532.1.1 (** Unknown UID: <1.2.124.113532.1.1>)
**)
ITEM Type: 53H (Asynchronous Operations Window Sub-Item) Length=4
Max # operations invoked=1 Max # operations performed=1
ITEM Type: 55H (Implementation Version Name) Length=12
Implementation Version Name: MITRA22JAN97
*****
*** Calling: BROKER Called: VARIS ***
*****

*****
*** Sending A-ASSOCIATE-ACCEPT to BROKER ***
*****

PDU Type: 02H (A-ASSOCIATE-AC) Length=322
Version=1 Called AE: "VARIS" Calling AE: "BROKER"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 1 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 3 Result=0 (acceptance)
-- Transfer Syntax(es) --

```

```

SUBITEM Type: 40H (Transfer Syntax Sub-Item)                                Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item)                                Length=25
Presentation Context ID: 5          Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                                Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item)                                Length=25
Presentation Context ID: 7          Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                                Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item)                                Length=25
Presentation Context ID: 9          Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                                Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item)                                Length=25
Presentation Context ID: 11         Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item)                                Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item)                                    Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item)                             Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item)                       Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name)                             Length=13
Implementation Version Name: VA DICOM V2.5

Sending PDU Type: 02H (A-ASSOCIATE-AC) Length: 322
D:\DICOM\Data1\LOGIMA.007\OUTGOING.PDU

Sending PDU Type: 04H (P-DATA-TF) Length: 1330 (1330)
D:\DICOM\Data1\U00107\U0010738.DCM      PDU len=168   PDV hdr=3, pc=7, len=162
Mon 07:30                               PDU len=1000  PDV hdr=0, pc=7, len=994
Mon 07:30                               PDU len=180   PDV hdr=2, pc=7, len=174

Sending PDU Type: 04H (P-DATA-TF) Length: 1412 (1412)
D:\DICOM\Data1\U00107\U0010739.DCM      PDU len=168   PDV hdr=3, pc=7, len=162
Mon 07:30                               PDU len=1000  PDV hdr=0, pc=7, len=994
Mon 07:30                               PDU len=262   PDV hdr=2, pc=7, len=256

Recving PDU Type: 04H (P-DATA-TF)      PDU len=166   PDV hdr=3, pc=7, len=160
D:\DICOM\Data1\V00107\V0010736.TMP      PDU len=102   PDV hdr=2, pc=7, len=96

Recving PDU Type: 04H (P-DATA-TF)      PDU len=166   PDV hdr=3, pc=7, len=160
D:\DICOM\Data1\V00107\V0010737.TMP      PDU len=102   PDV hdr=2, pc=7, len=96

Sending PDU Type: 04H (P-DATA-TF) Length: 1326 (1326)
D:\DICOM\Data1\U00107\U0010740.DCM      PDU len=168   PDV hdr=3, pc=7, len=162
Mon 07:30                               PDU len=1000  PDV hdr=0, pc=7, len=994
Mon 07:30                               PDU len=176   PDV hdr=2, pc=7, len=170

Recving PDU Type: 04H (P-DATA-TF)      PDU len=166   PDV hdr=3, pc=7, len=160
D:\DICOM\Data1\V00107\V0010738.TMP      PDU len=102   PDV hdr=2, pc=7, len=96

```

If the transmission of images needs to be terminated or suspended temporarily, this program may be interrupted by typing **Control-C** without any risk of data loss.

### 3.7 Display Text Gateway Statistics

This application displays statistics about the numbers of files and events that have been processed by the DICOM Text Gateway. In particular, this application allows the user to check that all messages have been sent to a commercial PACS. It also keeps a daily running tally of the number of different kinds of messages handled.



When the user double-clicks on this icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #3 (Display Text Gateway Statistics).

When this menu-option is started, a list of “TCP/IP Port Applications” is displayed, and the user is requested to select the application for which statistics are to be displayed. More than one application can be monitored, if additional telnet sessions are invoked.

The list of “TCP/IP Port Applications” is defined in the master file named **F:\DICOM\Dict\PortList.DIC**. Once an application is selected, the statistics for that application will be compiled and displayed.

The top of the display shows the current pointers for the various queues. (An initial value of 9999999 typically indicates that no activity has occurred for that queue at all). The rest of the display shows the event statistics: a count that indicates the number of occurrences of each event and the time of the last.

Every 30 seconds an updated set of statistics will be displayed. After each set of statistics, the program will ask whether or not to exit. If this question is not answered with “**Yes**”, the program will continue indefinitely.

## Real-Time DICOM Communications Statistics

```

1  DEJARNETTE MEDISHARE INTERFACE ----- Port #60042

OPTION:  1 <Enter>

*****
* DEJARNETTE      Priority      PACS      PACS      Hospital      Hospital      *
* MEDISHARE       Level        Request   Response   Request       Response      *
*  HL7 Delay      Name         Queue     Queue     Queue        Queue        *
*
*  <none>         HIGH          A:9999999 B:9999999   U:0020204    V:0020204    *
*                MEDIUM       C:9999999 D:9999999   W:0019674    X:0019674    *
* Space: 67%      LOW          E:9999999 F:9999999   Y:9999999    Z:9999999    *
*****

Events:  Count      Time
-----  -
ADT ADMIT: <none>
ADT DISCHARGE: <none>
ADT TRANSFER: <none>
PATIENT DEMOGRAPHIC CHANGE: <none>
ORDER ENTRY:      63  (12:16)
EXAM CHANGE: <none>
EXAM VERIFICATION: 39  (12:07)
EXAM COMPLETE: <none>
RELEASED (not verified) REPORT: 72 (12:22)
APPROVED REPORT:   4  (10:29)
Exit?  no // y <Enter>

```

There are four things to monitor on this status display: The HL7 Delay (top, left-hand side), the U/V and W/X Hospital Request/Response Queues (top, right-hand side), the daily message tally (lower, center), and Space (center, left-hand side).

The HL7 Delay indicates how far behind is the gateway in processing HL7 messages from the main hospital system. Most messages should be processed almost immediately, and only in the worst case should this number be behind. It is possible to “push back” the HL7 message pointer (see Section 3.12), in which case a significant delay will be observed as the gateway “catches up”.

The U/V and W/X Hospital Request/Response Queues tell how many messages have been created (U and W) and how many have been transmitted (V and X) -- Please see Table 3.11 for the definition of the queue letters. When everything is “caught up”, the response numbers should equal the request numbers. Otherwise, they will be less and the communications is behind (Check to see if perhaps the commercial PACS is down).

The daily message tally lists the last time and number of each kind of message. The “Space” field indicates the amount of free available disk space for new messages.

### 3.8 Display Modality Worklist Statistics

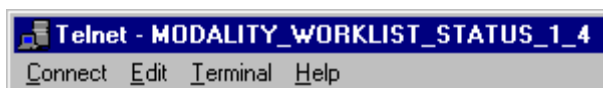
The DICOM Modality Worklist service transfers patient and study information to the image acquisition devices, so that this information does not have to be keyed in manually. This information is later placed in the DICOM header of the image so that it can be matched with the patient’s record.

The MUMPS Modality Worklist Provider process is a user-defined network service that is launched by the application startup program ^ZSTU whenever a TCP/IP connection request is received on port 60010. Each modality worklist request starts out by making a TCP/IP connection to port 60010, launching its MUMPS provider process to run in the background.

This procedure displays statistics about the Modality Worklist Queries that have been processed by the DICOM Text Gateway. There are two parts to the display. The first gives a history of the outstanding “open” cases. This is useful for quickly seeing how many studies are currently active for each imaging type. The ones that are old have probably not been “case edited”, so that they remain on the worklist. The second part of the display gives a daily running tally of number of queries from each instrument, and the number of successful hits. This is useful for debugging problems with the modality worklist service.



When the user double-clicks on this icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #4 (Display Modality Worklist Statistics).

When this menu-option is started, the statistics for the site will be compiled and displayed. The first table that is displayed shows the numbers of exams per day for the various imaging types in reverse chronological order (most recent date first).

The next table shows the number of queries that have been issued for each “Instrument Name” that is currently known to the system.

The list of “Instrument Names” that is presented are “Application Entities” defined in the master file named **F:\DICOM\Dict\WorkList.DIC**.

Every 30 seconds an updated set of statistics will be displayed. After each set of statistics, the program will ask whether or not to exit. If this question is not answered with “Yes”, the program will continue indefinitely.



Compiling modality worklist statistics for WICHITA-MC

Exam Date	Imaging Type -----				
	CT	MRI	NM	RAD	US
JUN 01	4	3	12	2	5
MAY 31	1				
MAY 27					2
MAY 26					3
MAY 25				1	7
. . .					
JAN 26				1	2
JAN 25					2
JAN 22					2
JAN 20					7
JAN 19				2	1
JAN 16				1	

Modality Worklist Activity -----			
Instrument Name -----	Queries -----	Time -----	Matches -----
IM_CR	<none>		
MS_FCR	<none>		
SCANNER1	<none>		
WIC-RADSCAN	<none>		
WORKLIST_PIC	3	10:17:13	5

Exit? no // y

In the last part of this report, all information relates to activity that took place “today”. The column labeled “**Queries**” displays the numbers of queries processed “today”. The column labeled “**Time**” shows the time-stamp for the most recent query, and the column labeled “**Matches**” shows the number of entries returned in that query.

### 3.9 Modality Worklist Query

**Note:** This function is primarily used to test the VistA Imaging Modality Worklist Service, and is somewhat involved. It is used to simulate exactly how a commercial imaging modality would generate a query and thereby exercise VistA. It is meant as a testing tool, and not for operational use.

Prerequisites:

- VistA Hospital Information System (for historical radiology only, where the data resides on the main hospital system). It is not needed for looking up active radiology and CPRS consult request tracking studies, as these are stored locally in a global in the gateway database.

This procedure generates queries against the local VistA Imaging DICOM Modality Worklist provider, and will display records from the response that match the arguments specified in the query request.

Use the Caché Terminal icon to start a session to simulate a Modality Worklist User.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #5 (Modality Worklist Query).

The program first asks for the name of the Modality Worklist provider that is to be queried. The list of DICOM Service Class Providers that can be called from VistA is defined in the master file named **F:\DICOM\Dict\SCU\_List.DIC**. (In the case of the example below, the Modality Worklist Provider is identified as “**LOCAL MODALITY WORKLIST**”.)

The user is then asked to identify the Modality Application Entity<sup>2</sup> to be simulated. The list of Application Entities that is presented is defined in the master file named **F:\DICOM\Dict\WorkList.DIC**.

Next, the user must select the type of query to be used. A query can be...

- By patient
- By study
- By modality
- By date/time

In the examples below, all names of patients and physicians have been replaced by “scrambled” names.

### 3.9.1 Query by Patient

The identity of the patient is entered, and then information will be returned for all patients and studies that match.

It is not necessary to type the complete name of the patient: all names that start with the characters entered will match the query. (i.e. just hitting <Enter> will select all patients). You can also enter the VA Quick PID (that is, the initial of the last name followed by the last four

---

<sup>2</sup> The term “Application Entity” is from the DICOM standard and refers to any provider or user of a DICOM service.

digits of the social security number). The Quick PID can be entered in either the patient name or patient id fields.

### 3.9.1.1 Query by Patient using Initial of Last Name

Modality Worklist Query  
Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// **2** <Enter>

Select the Application Entity Title: ? <Enter>

AE Titles in the WORKLIST.DIC file

-----

ALI\_SCU  
IMCR\_1  
SCANNER1  
TEST

Select the Application Entity Title: **TEST** <Enter>

#### First Screen

PATIENT NAME (1) :  
PATIENT ID (2) :  
ACCESSION NUMBER (3) :  
REQUESTED PROCEDURE ID (4) :  
MODALITY (5) :  
START DATE (6) :  
START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **1**

Enter the Patient Name: **L**

#### Second Screen

PATIENT NAME (1) : **L**  
PATIENT ID (2) :  
ACCESSION NUMBER (3) :  
REQUESTED PROCEDURE ID (4) :  
MODALITY (5) :  
START DATE (6) :  
START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**

Performing Query...

Sending the PDU to the SCP  
completed!

There are 8 matches... Push <Enter> for list

Social Sec#	Patient's Name	Case#	Procedure Description
-----	-----	-----	-----
1) 000-01-9676	IMAGPATIENT,ONE M.	1025	CR CHEST 2 VIEWS PA&LAT
2) 000-02-7748	IMAGPATIENT,TWO N.	687	US ECHOGRAM RETROPERITONEAL COMPLE
3) 000-02-7748	IMAGPATIENT,TWO N.	688	US ECHOGRAM PELVIC B-SCAN &/OR REA
4) 000-05-1613	IMAGPATIENT,THREE O.	975	INTRODUCTION OF CATHETER, AORTA

```
5) 000-05-1613  IMAGPATIENT,THREE O.      976      AORTO ABDOMEN CATH W/SERIAL FIL
6) 000-05-1613  IMAGPATIENT,THREE O.      977      X-RAY EXAM OF ABDOMEN 1 VIEW, P
7) 000-05-1613  IMAGPATIENT,THREE O.      978      SEDATION WITH OR WITHOUT ANALGE
8) 000-05-1613  IMAGPATIENT,THREE O.      979      CR ANGIO EXTREMITY BILAT S&I
```

Enter 1-8 to see study details: **1 <Enter>**

Patient Name: IMAGPATIENT,ONE M.

Patient Sex: M

Patient Identifier: 000-01-9676

Date of Birth: 10 December 1924

Accession Number: 102198-1025 Requested Proc ID: 1025

VA Procedure Code: 58 Name: CHEST 2 VIEWS PA&LAT

CPT Code: 71020 Name: CHEST X-RAY

Scheduled Starting: 21 November 1998 at 12:48:38

Requested By: IMAGPROVIDER,ONE M.

Requesting Service: PRIMARY CARE

Referring Physician: <unknown>

Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025

Reason for Study: <See the Additional Patient History field>

```
----- Medical History -----
73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG
YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH
INSPIRATION.R/O FX
-----
```

Is this the correct Patient and Study? n// **y <Enter>**

Push <Enter> to continue...

### 3.9.1.2 Query by Patient using Quick PID

Modality Worklist Query

Service Class Providers

-----

1 -- LOCAL IMAGE STORAGE

2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// **2 <Enter>**

Select the Application Entity Title: ? **<Enter>**

AE Titles in the WORKLIST.DIC file

-----

ALI\_SCU

IMCR\_1

SCANNER1

TEST

Select the Application Entity Title: **TEST <Enter>**

#### First Screen

PATIENT NAME (1) :

PATIENT ID (2) :

ACCESSION NUMBER (3) :

REQUESTED PROCEDURE ID (4) :

MODALITY (5) :

START DATE (6) :

START TIME (7) :  
 Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **1**  
 Enter the Patient Name: **I9676**

### Second Screen

PATIENT NAME (1) : **I9676**  
 PATIENT ID (2) :  
 ACCESSION NUMBER (3) :  
 REQUESTED PROCEDURE ID (4) :  
 MODALITY (5) :  
 START DATE (6) :  
 START TIME (7) :  
 Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**  
 Performing Query...  
 Sending the PDU to the SCP  
 completed!

Patient Name: IMAGPATIENT,ONE M.  
 Patient Sex: M  
 Patient Identifier: 000-01-9676  
 Date of Birth: 10 December 1924  
  
 Accession Number: 102198-1025      Requested Proc ID: 1025  
 VA Procedure Code: 58      Name: CHEST 2 VIEWS PA&LAT  
 CPT Code: 71020      Name: CHEST X-RAY  
 Scheduled Starting: 21 November 1998 at 12:48:38  
 Requested By: IMAGPROVIDER,ONE M.  
 Requesting Service: PRIMARY CARE  
 Referring Physician: <unknown>  
 Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025  
 Reason for Study: <See the Additional Patient History field>

----- Medical History -----  
 73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG  
 YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH  
 INSPIRATION.R/O FX  
 -----

Is this the correct Patient and Study? n// **y <Enter>**

Push <Enter> to continue...

### **3.9.2 Query by Study**

In DICOM, there are two different ways that a “by study” query may be performed:

- By Accession Number
- By Requested Procedure ID

**Note:** In VistA, the two queries are handled identically.

### 3.9.2.1 Query by Accession Number

Within the VA's Radiology Package, the DICOM Accession Number is defined to be the Date-Case Number, formatted "mmddyy-nnnnn", where "mmddyy" is derived from the date and "nnnnn" is the Case Number.

In the example below, the Date-Case Number and the Accession Number for the requested study is **102198-1025**.

Either the complete Date-Case Number or the shorter Case Number can be used for the Accession Number argument of the query. In both instances, the system will search the local database (i.e., the ^MAGDWLST global), and if a matching study is found, the information is returned. If no matching study is found in the local database for a "case number" query, a "null" is returned and the search ends.

For a "date-case number" query, however, an additional search is performed for the study in the main VistA system database (RAD/NUC MED PATIENT File (#70), stored in ^RADPT). If the study is found there, that information is returned. This capability is very useful "in the real world" when digitizing film for old studies.

#### 3.9.2.1.1 Query by Case Number

Modality Worklist Query  
Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// **2 <Enter>**

Select the Application Entity Title: TEST// **<Enter> TEST**

#### First Screen

```

PATIENT NAME (1) :
PATIENT ID (2) :
ACCESSION NUMBER (3) :
REQUESTED PROCEDURE ID (4) :
MODALITY (5) :
START DATE (6) :
START TIME (7) :

```

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **3**

Enter the Accession Number: **1025**

#### Second Screen

```

PATIENT NAME (1) :
PATIENT ID (2) :
ACCESSION NUMBER (3) : 1025
REQUESTED PROCEDURE ID (4) :
MODALITY (5) :
START DATE (6) :
START TIME (7) :

```

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**

Performing Query...

Sending the PDU to the SCP

completed!

Patient Name: IMAGPATIENT,ONE M.  
 Patient Sex: M  
 Patient Identifier: 000-01-9676  
 Date of Birth: 10 December 1924

Accession Number: 102198-1025      Requested Proc ID: 1025  
 VA Procedure Code: 58      Name: CHEST 2 VIEWS PA&LAT  
 CPT Code: 71020      Name: CHEST X-RAY  
 Scheduled Starting: 21 November 1998 at 12:48:38  
 Requested By: IMAGPROVIDER,ONE M.  
 Requesting Service: PRIMARY CARE  
 Referring Physician: <unknown>  
 Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025  
 Reason for Study: <See the Additional Patient History field>

----- Medical History -----  
 73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG  
 YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH  
 INSPIRATION.R/O FX  
 -----

Is this the correct Patient and Study? n// y <Enter>

Push <Enter> to continue...

### 3.9.2.1.2 Query by Accession (Date-Case) Number

Modality Worklist Query  
 Service Class Providers

- 1 -- LOCAL IMAGE STORAGE  
 2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// 2 <Enter>

Select the Application Entity Title: TEST// <Enter> TEST

#### First Screen

PATIENT NAME (1) :  
 PATIENT ID (2) :  
 ACCESSION NUMBER (3) :  
 REQUESTED PROCEDURE ID (4) :  
 MODALITY (5) :  
 START DATE (6) :  
 START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: 3  
 Enter the Accession Number: 102198-1025

#### Second Screen

PATIENT NAME (1) :  
 PATIENT ID (2) :  
 ACCESSION NUMBER (3) : 102198-1025  
 REQUESTED PROCEDURE ID (4) :  
 MODALITY (5) :  
 START DATE (6) :

```
START TIME (7) :
Enter 1-7 to change an item above, "R" to refresh, "Q" to query: Q
Performing Query...
Performing Query...
Sending the PDU to the SCP
completed!
    Patient Name: IMAGPATIENT,ONE M.
    Patient Sex: M
    Patient Identifier: 000-01-9676
    Date of Birth: 10 December 1924

    Accession Number: 102198-1025      Requested Proc ID: 1025
    VA Procedure Code: 58      Name: CHEST 2 VIEWS PA&LAT
    CPT Code: 71020      Name: CHEST X-RAY
    Scheduled Starting: 21 November 1998 at 12:48:38
    Requested By: IMAGPROVIDER,ONE M.
    Requesting Service: PRIMARY CARE
    Referring Physician: <unknown>
    Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025
    Reason for Study: <See the Additional Patient History field>

----- Medical History -----
73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG
YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH
INSPIRATION.R/O FX
-----

Is this the correct Patient and Study?  n// Y

Push <Enter> to continue...
```

### 3.9.2.2 Query by Requested Procedure ID

Within the VA's Radiology Package, the DICOM Requested Procedure ID is defined to be the Case Number, formatted "nnnnn".

In the example below, the Case Number and the Requested Procedure ID for the requested study is **1025**.

In VistA, Requested Procedure ID query is handled exactly like an Accession Number query.

```
Modality Worklist Query
Service Class Providers
-----
1 -- LOCAL IMAGE STORAGE
2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// 2 <Enter>

Select the Application Entity Title: TEST// <Enter> TEST
```

#### First Screen

```
PATIENT NAME (1) :
PATIENT ID (2) :
ACCESSION NUMBER (3) :
REQUESTED PROCEDURE ID (4) :
```



MODALITY (5) :  
 START DATE (6) :  
 START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **4**  
 Enter the Requested Procedure ID: **1025**

### Second Screen

PATIENT NAME (1) :  
 PATIENT ID (2) :  
 ACCESSION NUMBER (3) :  
 REQUESTED PROCEDURE ID (4) : **1025**  
 MODALITY (5) :  
 START DATE (6) :  
 START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**  
 Performing Query...

Sending the PDU to the SCP  
 completed!

Patient Name: IMAGPATIENT,ONE M.  
 Patient Sex: M  
 Patient Identifier: 000-01-9676  
 Date of Birth: 10 December 1924

Accession Number: 102198-1025      Requested Proc ID: 1025  
 VA Procedure Code: 58      Name: CHEST 2 VIEWS PA&LAT  
 CPT Code: 71020      Name: CHEST X-RAY  
 Scheduled Starting: 21 November 1998 at 12:48:38  
 Requested By: IMAGPROVIDER,ONE M.  
 Requesting Service: PRIMARY CARE  
 Referring Physician: <unknown>  
 Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025  
 Reason for Study: <See the Additional Patient History field>

----- Medical History -----  
 73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG  
 YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH  
 INSPIRATION.R/O FX  
 -----

Is this the correct Patient and Study? n// **<Enter>** no patient selected

Push **<Enter>** to continue...

### 3.9.3 Query by Modality

The type of modality is identified by its two-character abbreviation. Valid codes are shown below:

AS = Angioscopy (retired)	LS = Laser surface scan
AU = Audio	MA = Magnetic resonance angiography (retired)
BI = Biomagnetic imaging	MG = Mammography
CD = Color flow Doppler	MR = Magnetic Resonance
CF = Cinefluorography (retired)	MS = Magnetic resonance spectroscopy (retired)
CP = Colposcopy (retired)	NM = Nuclear Medicine
CR = Computed Radiography	OT = Other
CS = Cystoscopy (retired)	PR = Presentation State
CT = Computed Tomography	PT = Positron emission tomography (PET)
DD = Duplex Doppler	PX = Panoramic X-Ray
DF = Digital fluoroscopy (retired)	RF = Radio Fluoroscopy
DG = Diaphanography	RG = Radiographic imaging (conventional film/screen)
DM = Digital microscopy (retired)	RTDOSE = Radiotherapy Dose
DS = Digital Subtraction Angiography (retired)	RTIMAGE = Radiotherapy Image
DX = Digital Radiography	RTPLAN = Radiotherapy Plan
EC = Echocardiography (retired)	RTRECORD = RT Treatment Record
ECG = Electrocardiography	RTSTRUCT = Radiotherapy Structure Set
EPS = Cardiac Electrophysiology	SM = Slide Microscopy
ES = Endoscopy	SR = SR Document
FA = Fluorescein angiography (retired)	ST = Single-photon emission computed tomography (SPECT)
FS = Fundoscopy (retired)	TG = Thermography
GM = General Microscopy	US = Ultrasound
HC = Hard Copy	VF = Videofluorography (retired)
HD = Hemodynamic Waveform	VL = Visible Light (VA Addition)
IO = Intra-oral Radiography	XA = X-Ray Angiography
IVUS = Intravascular Ultrasound	XC = External-camera Photography
LP = Laparoscopy (retired)	

Modality Worklist Query  
Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// **2 <Enter>**

Select the Application Entity Title: TEST// **<Enter>** TEST

#### First Screen

```

PATIENT NAME (1) :
PATIENT ID (2) :
ACCESSION NUMBER (3) :
REQUESTED PROCEDURE ID (4) :
MODALITY (5) :
START DATE (6) :
START TIME (7) :
```

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **5**

Enter the Patient Name: **CR**

Second Screen

PATIENT NAME (1) :  
 PATIENT ID (2) :  
 ACCESSION NUMBER (3) :  
 REQUESTED PROCEDURE ID (4) :  
 MODALITY (5) : **CR**  
 START DATE (6) :  
 START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**  
 Performing Query...

Performing Query...  
 Sending the PDU to the SCP  
 completed!

	Social Sec#	Patient's Name	Case#	Procedure Description
1)	000-01-9676	IMAGPATIENT,ONE M.	1025	CR CHEST 2 VIEWS PA&LAT
2)	000-06-1318	IMAGPATIENT,FOUR P.	962	CR CHEST 2 VIEWS PA&LAT
3)	000-62-3667	IMAGPATIENT,FIVE K.	1041	CR CHEST 2 VIEWS PA&LAT
4)	000-03-0904	IMAGPATIENT,SIX	778	CR CHEST SINGLE VIEW
5)	000-80-6542	IMAGPATIENT,SEVEN E.	1044	CR CHEST 2 VIEWS PA&LAT
6)	000-76-4891	IMAGPATIENT,EIGHT K.	692	CR CHEST 2 VIEWS PA&LAT
7)	000-72-7867	IMAGPATIENT,NINE L.	1038	CR CHEST 2 VIEWS PA&LAT
8)	000-86-3557	IMAGPATIENT,TEN N.	1024	CR SPINE CERVICAL MIN 2 VIEWS
9)	000-70-5463	IMAGPATIENT,ELEVEN F.	1035	CR HAND 1 OR 2 VIEWS
10)	000-70-5463	IMAGPATIENT, ELEVEN F.	1036	CR FINGER(S) 2 OR MORE VIEWS
11)	000-52-3902	IMAGPATIENT,TWELVE S.	1029	FLUORO CHEST(SEPARATE PROCEDURE

Enter 1-11 to see study details: **1 <Enter>**

Patient Name: IMAGPATIENT,ONE M.  
 Patient Sex: M  
 Patient Identifier: 000-01-9676  
 Date of Birth: 10 December 1924

Accession Number: 102198-1025      Requested Proc ID: 1025  
 VA Procedure Code: 58      Name: CHEST 2 VIEWS PA&LAT  
 CPT Code: 71020      Name: CHEST X-RAY  
 Scheduled Starting: 21 November 1998 at 12:48:38  
 Requested By: IMAGPROVIDER,ONE M.  
 Requesting Service: PRIMARY CARE  
 Referring Physician: <unknown>  
 Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025  
 Reason for Study: <See the Additional Patient History field>

----- Medical History -----  
 73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG  
 YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH  
 INSPIRATION.R/O FX  
 -----

Is this the correct Patient and Study? n// **y <Enter>**

Push <Enter> to continue...

### 3.9.4 Query by Modality and Date/Time

The starting date/time for the examination can also be used, particularly with the modality query, to narrow the query.

From the date/time range, a starting date/time, and an ending date/time are calculated. All studies of the selected type falling in the selected interval will match the query. When no ending date/time is entered, all studies later than the starting date/time will match the query. Date/time ranges are entered as two values separated by a dash.

Modality Worklist Query  
Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST

Select the provider application (1-2): 2// **2 <Enter>**

Select the Application Entity Title: TEST// **<Enter> TEST**

#### First Screen

PATIENT NAME (1) :  
PATIENT ID (2) :  
ACCESSION NUMBER (3) :  
REQUESTED PROCEDURE ID (4) :  
MODALITY (5) :  
START DATE (6) :  
START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **5**

Enter the Patient Name: **CR**

#### Second Screen

PATIENT NAME (1) :  
PATIENT ID (2) :  
ACCESSION NUMBER (3) :  
REQUESTED PROCEDURE ID (4) :  
MODALITY (5) : **CR**  
START DATE (6) :  
START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **6**

Enter Start Date (yyyymmdd or yyyymmdd-yyyymmdd): **19981121**

#### Third Screen

PATIENT NAME (1) :  
PATIENT ID (2) :  
ACCESSION NUMBER (3) :  
REQUESTED PROCEDURE ID (4) :  
MODALITY (5) : **CR**  
START DATE (6) : **19981121**  
START TIME (7) :

Enter 1-7 to change an item above, "R" to refresh, "Q" to query: **q**

Performing Query...

Performing Query...

Sending the PDU to the SCP  
completed!

	Social Sec#	Patient's Name	Case#	Procedure Description
1)	000-01-9676	IMAGPATIENT,ONE M.	1025	CR CHEST 2 VIEWS PA&LAT
2)	000-06-1318	IMAGPATIENT,FOUR P.	962	CR CHEST 2 VIEWS PA&LAT

Enter 1-2 to see study details: **1 <Enter>**

Patient Name: IMAGPATIENT,ONE M.

Patient Sex: M

Patient Identifier: 000-01-9676

Date of Birth: 10 December 1924

Accession Number: 102198-1025 Requested Proc ID: 1025

VA Procedure Code: 58 Name: CHEST 2 VIEWS PA&LAT

CPT Code: 71020 Name: CHEST X-RAY

Scheduled Starting: 21 November 1998 at 12:48:38

Requested By: IMAGPROVIDER,ONE M.

Requesting Service: PRIMARY CARE

Referring Physician: <unknown>

Study UID: 1.2.840.113754.1.4.523.7018978.8751.1.102198.1025

Reason for Study: <See the Additional Patient History field>

----- Medical History -----  
73 Y/O MALE PRESENTS TO URGENT CARE C/O CHEST PAIN AFTER TRAUMA WITH AIRBAG  
YESTERDAY DURING MVA.DENIES SOB,HEMOPTYSIS OR COUGH.PAIN WORSENS WITH  
INSPIRATION.R/O FX  
-----

Is this the correct Patient and Study? n// **y <Enter>**

Push <Enter> to continue...

### 3.10 Display a HL7 Message

This procedure displays the contents of HL7 messages for debugging purposes.

Use the Caché Terminal icon to start a session for this menu option.



Caché  
Terminal

After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #7 (Display a HL7 Message).

There are two display formats:

- Short
- Long

The short format outputs the text of the messages as they are stored within the VistA ^MAGDHL7 global (condensed, all optional spaces removed, all separator characters visible). The long format outputs the messages so that all fields are labeled and displayed on separate lines. The long format also identifies each message segment.

### 3.10.1 Short Format

Enter output device ("S" for screen or "F" for file): S// **<Enter>** Screen  
Format (Long or Short) S// **S <Enter>**

Enter HL7 subscript: **461405 <Enter>**

```
MSH^~|\&^RA-SERVER-IMG^523^MAGD-CLIENT^523^19981014000017^^ORM-O01^3789535^P^2.1
...1^~~~~~USA
PID^^000-07-4067^93092~4~D99^^IMAGPATIENT~FIVE~Q^^19220514^M^~~~~~000074067
ORC^CA^~~~~CA^~~~~19981014000017
OBR^^7018986.8646-1~101398-495~L^71021~CHEST X-RAY~CPT4~59~CHEST APICAL LORDOTI
...IC~99RAP^^19981014000017^"^^"^^"^^"^^"^^16661~IMAGPROVIDER~TWO~N^^9B/TELM^^32~GI
... SUITE~523~BOSTON, MA^RAD~GENERAL RADIOLOGY^19981014000017
OBX^^CE^P~PROCEDURE~L^^59~CHEST APICAL LORDOTIC~L^~~~~~"
OBX^^TX^M~MODIFIERS~L^^None^~~~~~"
OBX^^TX^H~HISTORY~L^^This is a 76 yo wm pmh of 3v cabg 12/97, cad, afib presents
...s to medicine with^~~~~~"
OBX^^TX^H~HISTORY~L^^dizziness, chest pressure. A previous exam on 10/2 and 10/
.../3 demonstrates a^~~~~~"
OBX^^TX^H~HISTORY~L^^right apical opacity measuring 2cm that was not further wor
...rked up. The pt has^~~~~~"
OBX^^TX^H~HISTORY~L^^been admitted repeatedly for the same chest pressure of unc
...clear etiology. The^~~~~~"
OBX^^TX^H~HISTORY~L^^pain does not appear to be cardiac in origin. Please perfo
...orm lordotic cxr to^~~~~~"
OBX^^TX^H~HISTORY~L^^further evaluate rul opacity. Thanks. ^~~~~~"
```

Enter HL7 subscript:

Push **<Enter>** to continue...

### 3.10.2 Long Format

Enter output device ("S" for screen or "F" for file): S// **<Enter>** Screen  
Format (Long or Short) S// **L <Enter>**

Enter HL7 subscript: **461405 <Enter>**

HL7 Message (Subscript = 461405)

```
MSH -- Message Header Segment
1           Field Separator = ^
2           Encoding Characters = ~|\&
3           Sending Application = RA-SERVER-IMG
4           Sending Facility = 523
5           Receiving Application = MAGD-CLIENT
6           Receiving Facility = 523
```

```

7           Date/Time of Message = 19981014000017
9           Message Type = ORM~O01
10          Message Control ID = 3789535
11          Processing ID = P
12          Version ID = 2.1
17          Country Code = USA

PID -- Patient Identification Segment
2           Patient ID (External ID) = 000-07-4067
3           Patient ID (Internal ID) = 93092~4~D99
5           Patient Name = IMAGPATIENT~FIVE~Q
7           Date of Birth = 19220514
8           Sex = M
19          SSN Number - Patient = 000074067

ORC -- Common Order Segment
1           Order Control = CA
5           Order Status ID = CA
9           Date/Time of Transaction = 19981014000017

OBR -- Observation Request
3           Filler Order Number = 7018986.8646-1~101398-495~L
4           Universal Service ID = 71021~CHEST X-RAY~CPT4~59~CHEST APICAL L
ORDOTIC~99RAP
7           Observation Date/Time = 19981014000017
8           Observation End Date/Time = " "
9           Collection Volume = " "
14          Specimen Received Date/Time = " "
16          Ordering Provider = 16661~IMAGPROVIDER~TWO~N
18          Placer field #1 = 9B/TELM
20          Filler field #1 = 32~GI SUITE~523~BOSTON, MA
21          Filler field #2 = RAD~GENERAL RADIOLOGY
22          Results Rpt/Status Chng Date/T = 19981014000017

OBX -- Observation Segment
2           Value Type = CE
3           Observation Identifier = P~PROCEDURE~L
5           Observation Value = 59~CHEST APICAL LORDOTIC~L
11          = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = M~MODIFIERS~L
5           Observation Value = None
11          = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L
5           Observation Value = This is a 76 yo wm pmh of 3v cabg 12/97,
cad, afib presents to medicine with
11          = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L
5           Observation Value = dizziness, chest pressure. A previous e
xam on 10/2 and 10/3 demonstrates a
11          = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L

```

```

5           Observation Value = right apical opacity measuring 2cm that
was not further worked up.  The pt has
11                                     = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L
5           Observation Value = been admitted repeatedly for the same ch
est pressure of unclear etiology.  The
11                                     = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L
5           Observation Value = pain does not appear to be cardiac in or
igin.  Please perform lordotic cxr to
11                                     = " "

OBX -- Observation Segment
2           Value Type = TX
3           Observation Identifier = H~HISTORY~L
5           Observation Value = further evaluate rul opacity.  Thanks.
11                                     = " "

```

Enter HL7 subscript:

Push <Enter> to continue...

### 3.11 Display an Unprocessed DICOM Message

When the VistA DICOM Text Gateway software processes binary encoded DICOM messages, it automatically produces text files (\*.TXT) containing the information in human-readable form. These files can be viewed from Windows Explorer™ using **notepad**™. An easy way to launch Windows Explorer is to push “Windows-E”. (The “Windows” keys are next to the “Alt” keys on the bottom row of the keyboard.)

In order to view these text files from Explorer, you first have to know where they are located. The PACS message files are stored as D:\DICOM\Data1\Qnnnn\Qnnnnnnnn.txt, where “Q” is the letter assigned to the first-in-first-out (FIFO) queue, and “nnnnnnn” is the seven-digit file number. The FIFO queues are illustrated in Table 3.11.

The Modality Worklist queries and responses are stored under D:\DICOM\Data1\LOGxxx.nnn, where “xxx” is the three-letter system name, and “nnn” is the job number. (This information can be obtained from the DICOM application message log – see Section 6.2.2.) The acquired image files are stored in D:\DICOM\Image\_in\Lnnnnnnnn.dcm. (The user may also want to refer to Chapter 9.)



### First-In-First-Out Data Queues

Direction	Queue Letter	Type	Priority	Usage
INCOMING Device ^ Gateway	A	Request	High	Reserved
	B	Response		
	C	Request	Medium	Reserved
	D	Response		
	E	Request	Low	Reserved
	F	Response		
	G	Request	Immediate	DICOM Echo
	H	Response		
In	I	Imaging		\\dicom\\image_in\\Annnnnnnn.dcm
OUTGOING Gateway ^ Device	S	Request	Immediate	DICOM Echo
	T	Response		
	U	Request	High	Orders, Changes to Orders, and Exam Verification
	V	Response		
	W	Request	Medium	ADT, Patient Demographics, and Reports
	X	Response		
	Y	Request	Low	Pull Lists and Clinic Scheduling (to be done)
	Z	Response		

**Table 3.11**

This menu option is used to manually invoke the same DICOM-to-text conversion routine and can be used to view unprocessed DICOM messages. It may be more convenient to use than Explorer, since it automatically performs the navigation to view the files. This capability is especially useful for looking at image headers (see Section 4.17).

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #7 (Display a DICOM Message).

The example below shows the formatted output of the information in the file D:\DICOM\Data1\W00000\W0000001.DCM.

The name of this file can be entered using the queue letter “W” and file number “1” as a shortcut.

Ready to read a DICOM file? y// y <Enter>

Enter output device ("S" for screen or "F" for file): S// <Enter> Screen

Enter the queue letter (a-h or s-z), or I for image (or '^' to exit): W// W <Enter>

Enter file number (or path): 1 <Enter>

DUMP of DICOM file D:\DICOM\Data1\W00000\W0000001.DCM

```

O      G      E      L      Created at 10:37 AM on 17-JUN-1999
f      r      l      e
f      o      e      n
s      u      m      g
e      p      e      t
t      n      h      A t t r i b u t e      V a l u e
                        -----
000000:0000,0000 UL 0004 Group Length      "130 (0x00000082)"
00000C:0000,0001 UL 0004 Length to End      "872 (0x00000368)"
000018:0000,0002 UI 0018 Affected SOP Class UID      "1.2.840.113754.3.1.2.2.1"
                                VA Detached Visit Management SOP Class
000038:0000,0100 US 0002 Command Field      "256 (0x0100)"
000042:0000,0110 US 0002 Message ID      "2 (0x0002)"
00004C:0000,0700 US 0002 Priority      "0 (0x0000)"
000056:0000,0800 US 0002 Data Set Type      "3 (0x0003)"
000060:0000,1000 UI 001C Affected SOP Instance UID      "1.2.840.113754.1.3.523.79836"
000084:0000,1002 US 0002 Event Type ID      "3 (0x0003)"
00008E:0008,0012 DA 0008 Instance Creation Date      "19981020"
00009E:0008,0013 TM 0006 Instance Creation Time      "175150"
0000AC:0008,0014 UI 0016 Instance Creator UID      "1.2.840.113754.1.0.523"
0000CA:0008,0082 SQ FFFF Institution Code Sequence 1
0000D2:FFFF,E000 SQ FFFF >Item Begin      1.1
0000DA:0008,0100 SH 0000 >Code Value      "<unknown>"
0000E2:0008,0102 SH 0000 >Coding Scheme Designator      "<unknown>"
0000EA:0008,0104 LO 0000 >Code Meaning      "<unknown>"
0000F2:FFFF,E00D SQ 0000 >Item End      1.1
0000FA:FFFF,E0DD SQ 0000 >Sequence End      1
000102:0008,1120 SQ FFFF Referenced Patient Sequen 1
00010A:FFFF,E000 SQ FFFF >Item Begin      1.1
000112:0008,1150 UI 0018 >Referenced SOP Class UID      "1.2.840.113754.3.1.2.1.1"
                                VA Detached Patient Management SOP Class
000132:0008,1155 UI 001C >Referenced SOP Instance      "1.2.840.113754.1.1.523.79836"
000156:FFFF,E00D SQ 0000 >Item End      1.1
00015E:FFFF,E0DD SQ 0000 >Sequence End      1
000166:0009,0010 LO 0008 Owner of Group      "VA DHCP"
000176:0009,1010 SQ FFFF Referring Physician Seque 1
00017E:FFFF,E000 SQ FFFF >Item Begin      1.1
000186:0008,0090 PN 0000 >Referring Physician's Na      "<unknown>"
00018E:0008,0092 ST 0000 >Referring Physician's Ad      "<unknown>"
000196:0008,0094 SH 0000 >Referring Physician's Te      "<unknown>"
00019E:0008,0100 SH 0000 >Code Value      "<unknown>"
0001A6:0008,0102 SH 0000 >Coding Scheme Designator      "<unknown>"
0001AE:FFFF,E00D SQ 0000 >Item End      1.1
0001B6:FFFF,E0DD SQ 0000 >Sequence End      1
0001BE:0009,1020 SQ FFFF Performing Physician Sequ 1
0001C6:FFFF,E000 SQ FFFF >Item Begin      1.1
0001CE:0008,0100 SH 0000 >Code Value      "<unknown>"
0001D6:0008,0102 SH 0000 >Coding Scheme Designator      "<unknown>"
0001DE:0008,1050 PN 0000 >Performing Physician's N      "<unknown>"
0001E6:FFFF,E00D SQ 0000 >Item End      1.1
0001EE:FFFF,E0DD SQ 0000 >Sequence End      1

```

```

0001F6:0010,0010 PN 0012 Patient's Name      "IMAGPATIENT^TWO^N"
000210:0010,0020 LO 000C Patient ID          "000-02-7748"
000224:0010,0021 LO 0004 Issuer of Patient ID "523"
000230:0010,0030 DA 0008 Patient's Birth Date "19330315"
000240:0010,0040 CS 0002 Patient's Sex       "M"
00024A:0010,1000 LO 0006 Other Patient IDs    "L7748"
000258:0010,1040 LO 0000 Patient's Address   "<unknown>"
000260:0010,2160 SH 0000 Ethnic Group        "<unknown>"
000268:0010,21B0 LT 0000 Additional Patient Histor "<unknown>"
000270:0038,0008 CS 0008 Visit Status ID      "ADMITTED"
000280:0038,0020 DA 0008 Admitting Date      "19981020"
000290:0038,0021 TM 0006 Admitting Time      "175150"
00029E:0038,0030 DA 0000 Discharge Date      "<unknown>"
0002A6:0038,0032 TM 0000 Discharge Time      "<unknown>"
0002AE:0039,0010 LO 0008 Owner of Group       "VA DHCP"
0002BE:0039,1010 SQ FFFF Current Patient Location 1
0002C6:FFFE,E000 SQ FFFF >Item Begin          1.1
0002CE:0008,0100 SH 0000 >Code Value         "<unknown>"
0002D6:0008,0102 SH 0000 >Coding Scheme Designator "<unknown>"
0002DE:0038,0300 LO 0000 >Current Patient Location "<unknown>"
0002E6:FFFE,E00D SQ 0000 >Item End            1.1
0002EE:FFFE,E0DD SQ 0000 >Sequence End        1
0002F6:0039,1020 SQ FFFF Patient's Institutional R 1
0002FE:FFFE,E000 SQ FFFF >Item Begin          1.1
000306:0008,0100 SH 0000 >Code Value         "<unknown>"
00030E:0008,0102 SH 0000 >Coding Scheme Designator "<unknown>"
000316:0038,0400 LO 0000 >Patient's Institution Re "<unknown>"
00031E:FFFE,E00D SQ 0000 >Item End            1.1
000326:FFFE,E0DD SQ 0000 >Sequence End        1
00032E:FFFD,0010 LO 0008 Owner of Group       "VA DHCP"
00033E:FFFD,1010 ST 003A Message Handle      "ADT ADMIT"
"D:\DICOM\Data1\W00000\W0000001.DCM"
"HL7(466004)"

```

End of File D:\DICOM\Data1\W00000\W0000001.DCM (printed 10:45 AM 17-JUN-99)

Enter file number (or path): **<Enter>**

Enter the queue letter (a-h or s-z), or I for image (or '^' to exit): W// ^ **<Enter>**

Push **<Enter>** to continue...

When more than a screenful of information is to be displayed is, the program will pause with the prompt “more...”. If the user wishes to terminate the display, this question can be answered with “^”, “No”, “Quit” or “Exit” (this response is not case sensitive).

The \*.TXT file that is automatically generated when the \*.DCM file is processed contains the exactly the same data.

### 3.12 Modify the HL7 Message Pointer

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #8 (Modify the HL7 Message Pointer).

HL7 messages are sequentially stored in chronological order in the VistA Database in the PACS MESSAGES File (#2006.5), stored in ^MAGDHL7 ( 2006 . 5 , ... ). Very rarely, because of unforeseen operational difficulties, it is necessary to change the order of processing of the HL7 messages.

The VistA Imaging DICOM Gateway maintains a pointer to the last HL7 message that has been processed (i.e., its internal entry number). This pointer value may be modified to resume processing at a different position in the queue.

Decrementing this pointer will have the effect that old HL7 messages in the VistA Hospital Information System will be processed again (Reprocessing HL7 messages has no adverse side-effects). Incrementing this pointer will have the effect that HL7 messages will be skipped, and associated data will not be sent to the destination (This should not be done).

The user may either enter message number, or a date. When the message number is entered, it should be one less than that of the next HL7 message to be processed. When a date is entered, the pointer is moved to the last record that precedes this date.

The dialog for this menu-option may appear as follows:

```
Current HL7 Pointer Value: 465230 (OCT 19, 1998@23:24:00)
Enter new value of HL7 pointer or date: 466000 <Enter>
```

```
New HL7 Pointer Value: 466000 (OCT 20, 1998@17:42:00)
```

```
Push <Enter> to continue...
```

or like this:

```
Current HL7 Pointer Value: 466000 (OCT 20, 1998@17:42:00)
Enter new value of HL7 pointer or date: 18 oct 1998<Enter>
```

```
New HL7 Pointer Value: 464083 (OCT 17, 1998@23:53:00)
```

```
Push <Enter> to continue...
```

or like this:

```
Current HL7 Pointer Value: 464083 (OCT 17, 1998@23:53:00)
Enter new value of HL7 pointer or date: t-5<Enter>
```

```
New HL7 Pointer Value: 466632 (OCT 21, 1998@13:42:00)
```

```
Push <Enter> to continue...
```

### 3.13 Generate a Daily Summary Report

This menu-option may be used to produce a report that shows how often the following events have been processed.

- ADT ADMIT
- ADT DISCHARGE
- ADT TRANSFER
- PATIENT DEMOGRAPHIC CHANGE
- ORDER ENTRY
- EXAM CHANGE
- EXAM VERIFICATION
- EXAM COMPLETE
- RELEASED (not verified) REPORT
- APPROVED REPORT
- GET IMAGE REQUEST (Only if a PACS is sending images)
- GET IMAGE REPLY (Only if a PACS is sending images)

The report will show the counts for the various events per day, starting from the first day for which statistics were recorded.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #9 (Generate a Daily Summary Report).

```
Generate Audit Report?  y// <Enter> yes
```

```
Enter output device ("S" for screen or "F" for file): S// <Enter> Screen
```

```
A: ADT ADMIT
B: ADT DISCHARGE
C: ADT TRANSFER
D: PATIENT DEMOGRAPHIC CHANGE
E: ORDER ENTRY
F: EXAM CHANGE
G: EXAM VERIFICATION
H: EXAM COMPLETE
I: RELEASED (not verified) REPORT
J: APPROVED REPORT
```

```
A      B      C      D      E      F      G      H      I      J
```

```
06/03/99
```

06/04/99	5	1	1	12	1	1	
06/07/99	509	212	98	1652	100	1473	1683
06/11/99	3		1	1	1	1	

Push <Enter> to continue...

This data may be used to monitor the different kinds of messages that were transmitted over a long time period.

### 3.14 Purge Old Modality Worklist Entries

This menu-option may be used to remove old entries in the DICOM Modality Worklist from the VistA Imaging DICOM Gateway. (When a study is “case edited”, an Exam Verification HL7 message is generated and sent to the VistA Imaging DICOM Gateway. This message then causes the corresponding study to be removed from the DICOM Modality Worklist. These old entries may still be present because they were never “case edited” in the radiology package, and no Exam Verification HL7 message was generated.) When this menu-option is executed, entries older than the specified number of days will be deleted.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #10 (Purge Old Modality Worklist Entries).

The default number of days to retain messages is specified as site parameter “**Purge-Retention Days PACS File**” in the IMAGING SITE PARAMETERS File (#2006.1) .

```
Ready to remove old DICOM Worklist entries? y// <Enter> yes
Delete DICOM Worklist entries that are older than how many days? 20// <Enter> 20
Deleting for BOSTON, MA
Deleting for BOSTON OC, MA
Push <Enter> to continue...
```

### 3.15 Purge Old DICOM Message Files

The **HIS to DICOM Text Interface** menu-option program (see Section 3.5) will automatically invoke this purge function when the amount of available free disk space drops below a minimum level, whose value is specified in the site parameter “**Pct Free Space DICOM msgs**” the IMAGING SITE PARAMETERS File (#2006.1).

The default number of days to retain messages is specified in the site parameter “**Retention Days DICOM msgs**” in the IMAGING SITE PARAMETERS File (#2006.1).

This menu-option may be used to remove old DICOM message files from the VistA Imaging DICOM Gateway PC. When this menu-option is executed, message files will be deleted if they are older than the specified number of days. (This option is usually not necessary, as old messages should be purged automatically. You might want to use it to recover additional disk space.)

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #11 (Purge Old DICOM Message Files).

```
Ready to remove old DICOM files from servers?  y// <Enter> yes
```

```
Delete DICOM files that are older than how many days?  20// <Enter> 20
```

```
Scanning the A queue
```

```
D:\DICOM\Data1\A*.  *** Not on file ***
```

```
Scanning the B queue
```

```
D:\DICOM\Data1\B*.  *** Not on file ***
```

```
Scanning the C queue
```

```
D:\DICOM\Data1\C*.  *** Not on file ***
```

```
Scanning the D queue
```

```
D:\DICOM\Data1\D*.  *** Not on file ***
```

These directories are empty.

```
Scanning the E queue
```

```
D:\DICOM\Data1\E*.  *** Not on file ***
```

```
Scanning the F queue
```

```
D:\DICOM\Data1\F*.  *** Not on file ***
```

```
Scanning the G queue
```

```
D:\DICOM\Data1\G*.  *** Not on file ***
```

```
Scanning the H queue
```

```
D:\DICOM\Data1\H*.  *** Not on file ***
```

```
Scanning the S queue
```

```
D:\DICOM\Data1\S*.  
```

```
Save Directory: S99999
```

```
Save Directory: S99998
```

These directories are too new to delete.

Save Directory: S99997

Scanning the T queue  
D:\DICOM\Data1\T\*. \*\*\* Not on file \*\*\*

Scanning the U queue  
D:\DICOM\Data1\U\*.  
Save Directory: U00032  
Save Directory: U00031  
Save Directory: U00030

These directories are too new to delete.

Scanning the V queue  
D:\DICOM\Data1\V\*. \*\*\* Not on file \*\*\*

Scanning the W queue  
D:\DICOM\Data1\W\*.  
Save Directory: W00025  
Save Directory: W00024  
Save Directory: W00023

These directories are too new to delete.

Scanning the X queue  
D:\DICOM\Data1\X\*. \*\*\* Not on file \*\*\*

Scanning the Y queue  
D:\DICOM\Data1\Y\*. \*\*\* Not on file \*\*\*

Scanning the Z queue  
D:\DICOM\Data1\Z\*. \*\*\* Not on file \*\*\*

Scanning the A queue  
D:\DICOM\Data2\A\*. \*\*\* Not on file \*\*\*

Scanning the B queue  
D:\DICOM\Data2\B\*. \*\*\* Not on file \*\*\*

These directories are empty.

Scanning the C queue  
D:\DICOM\Data2\C\*. \*\*\* Not on file \*\*\*

Scanning the D queue  
D:\DICOM\Data2\D\*. \*\*\* Not on file \*\*\*

Scanning the E queue  
D:\DICOM\Data2\E\*. \*\*\* Not on file \*\*\*

Scanning the F queue  
D:\DICOM\Data2\F\*. \*\*\* Not on file \*\*\*

Scanning the G queue  
D:\DICOM\Data2\G\*. \*\*\* Not on file \*\*\*

Scanning the H queue  
D:\DICOM\Data2\H\*. \*\*\* Not on file \*\*\*

Scanning the S queue  
D:\DICOM\Data2\S\*.



Save Directory: S99999  
 Save Directory: S99998  
 Save Directory: S99997

These directories are too new to delete.

Scanning the T queue  
 D:\DICOM\Data2\T\*. \*\*\* Not on file \*\*\*

Scanning the U queue  
 D:\DICOM\Data2\U\*. \*\*\* Not on file \*\*\*

Scanning the V queue  
 D:\DICOM\Data2\V\*. \*\*\* Not on file \*\*\*

Scanning the W queue  
 D:\DICOM\Data2\W\*. \*\*\* Not on file \*\*\*

These directories are empty.

Scanning the X queue  
 D:\DICOM\Data2\X\*. \*\*\* Not on file \*\*\*

Scanning the Y queue  
 D:\DICOM\Data2\Y\*. \*\*\* Not on file \*\*\*

Scanning the Z queue  
 D:\DICOM\Data2\Z\*. \*\*\* Not on file \*\*\*

Push <Enter> to continue...

### 3.16 Purge Old HL7 Transaction Global Nodes

This menu-option may be used to remove old HL7 messages from the VistA Hospital Information System. When this menu-option is executed, messages will be deleted if they are older than the specified number of days. The purge should be done monthly.

The number of days that is used is the value that is entered for the site parameter called “**Purge-Retention Days PACS File**” in the IMAGING SITE PARAMETERS File (#2006.1).

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #12 (Purge Old HL7 Transaction Global Nodes).

Ready to remove old HL7 transaction global nodes? y// <Enter> yes  
 .....

Push <Enter> to continue...

### 3.17 Purge Old Audit Records

This menu-option may be used to remove old audit records from the VistA Hospital Information System. This menu-option only removes audit records that are related to the VistA PACS transactions. When this menu-option is executed, audit records will be deleted if they are older than the date that is entered (records created on the date entered will remain in the database). This might be done annually.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #13 (Purge Old Audit Records).

After login, select the following menu options:

1. In the first menu, select #1 (Text Gateway).
2. In the second menu, select #5 (Modality Worklist Query).

The database currently contains audit data related to VistA-PACS Transactions covering the period from 7-Jan-1997 until 19-Jul-1999.  
Purge all audit data up to... 7-Jan-1997//**6-jul-99**<Enter>  
Purging...

Press <Enter> to continue:

# Chapter 4 Image Gateway

## 4.1 Overview of the DICOM Image Storage Process

The DICOM Storage Service (technically known as **MAG\_C-STORE**) is used to transfer image files from an acquisition modality or a commercial PACS to VistA, or from VistA to workstations or commercial PACS. Images are always transferred from the user of the storage service to the provider of the storage service. At different times, the same physical system can operate as either a provider of the storage service or as a user of the storage service. A VistA DICOM Image Gateway, for example, functions as a storage service class provider when it receives images from an image acquisition modality (e.g., CT), but it functions as a storage service class user when it sends images to a commercial PACS.

### 4.1.1 VistA Implementation of DICOM Storage Service

In the VistA DICOM implementation, each instrument (Application Entity) sending images to VistA has its own dedicated storage service class provider. A VistA storage service class provider consists of a pair of processes: a low-level high-speed network image file transfer process (**MAG\_CSTORE.EXE**) written in C operating with a high-level DICOM storage control process written in MUMPS. These two processes are tightly coupled and communicate with each other via TCP/IP.

Images are received from the instrument by the **MAG\_CSTORE . EXE** image file transfer process running in the foreground. The C routine has just enough intelligence to receive an image from the modality and write it to disk, and relies on the MUMPS process running in the background to handle all of the higher-level DICOM responsibilities (such as association negotiation, handling storage service messages, and naming the image files).

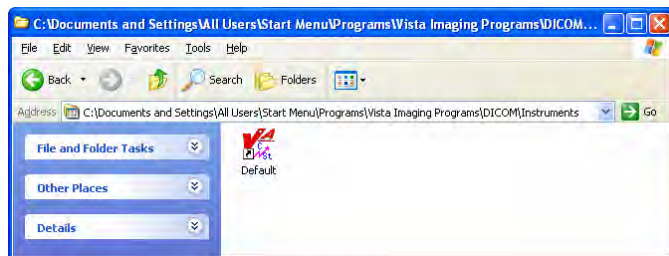
The MUMPS DICOM storage controller is a user-defined network service that is launched whenever a TCP/IP connection request is received on port 60000. Each **MAG\_CSTORE . EXE** process creates a TCP/IP connection to port 60000 when it starts up, launching its MUMPS surrogate process to run in the background. MUMPS begins the session by obtaining the instrument mnemonic from the foreground C process and returning the corresponding listening port number (60100-60999) from the dictionary in **F:\DICOM\Dict\Instrument.DIC** dictionary.

After this initial handshake, the foreground **MAG\_CSTORE . EXE** process listens on its designated port for image storage association requests generated by the instruments. When they are presented, they are passed to the MUMPS DICOM storage controller for validation and negotiation. Once the association is established, the instruments send image storage requests to VistA. These are received by the foreground **MAG\_CSTORE . EXE** process, and again passed onto the MUMPS process. The MUMPS process determines the name of the file (from the **^MAGDINPT** global, typically **D:\DICOM\image\_in\Lnnnnnnn.dcm**), passes the name back, and image transfer to storage proceeds. After the image transfer is complete, the instrument terminates the association, and the two processes go back to their “listening” state.

### 4.1.2 VistA Storage Server Processes

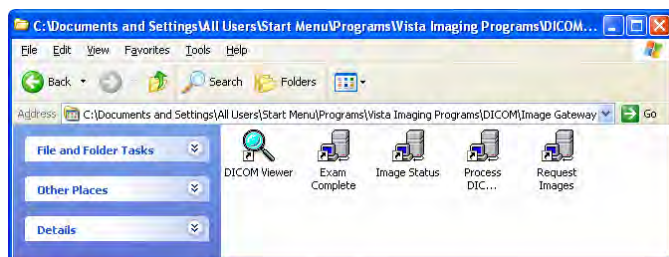
Each individual image acquisition instrument must be defined in the master file named **F:\DICOM\Dict\Instrument.DIC**. There is a shortcut (to MAG\_CSTORE.EXE) in the DICOM Instruments folder for every image acquisition instrument that can send images to the system.

The shortcuts in the folder %ALLUSERSPROFILE%\Start Menu\Programs\VistA Imaging Programs\DICOM\Instruments correspond to the entries in the master file **F:\DICOM\Dict\Instrument.DIC**.



**Note:** The user will usually see more instruments than shown above. This folder is populated using menu option **4-2-9** (Create Shortcuts for Instruments), see section 6.3.9.

The folder for the Image Gateway contains the shortcuts shown below. A site may add some site-specific icons, corresponding to the kind of image acquisition equipment at the site.

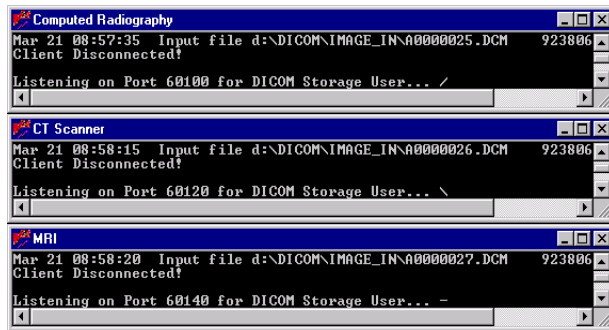


**Note:** Refer to the VistA Imaging DICOM Gateway Installation Guide for information on how to modify the setup parameters for these shortcuts.

The following two figures show how to allocate screen real estate for all the different DICOM Image Gateway process running on the desktop. (The various processes shown are started by clicking on the corresponding icons in the DICOM Image Gateway folder. See Section 4.5 for positioning instructions.)

The first figure illustrates the typical image gateway screen layout, where all of the modalities send their images directly to VistA. Note that only the acquisition devices that are sending images to this gateway have visible icons in the DICOM Instruments folder.

## Typical Image Gateway Screen Layout



**Image Status  
Window**

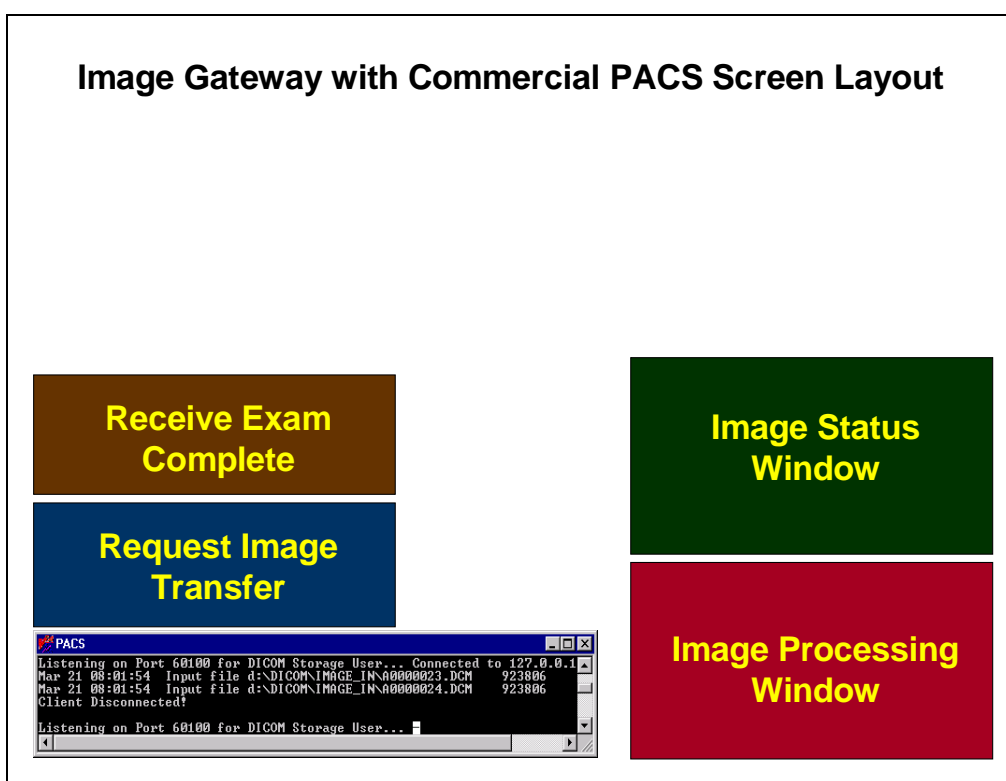
**Image Processing  
Window**

The next figure illustrates the screen layout when VistA is configured to receive images from a commercial PACS.

**Note:** Not all PACS use this method. Some just autoroute images to VistA and do not require these additional processes

In this example, the icons in the DICOM Image Gateway folder have been rearranged to include the “Receive Exam Complete” and “Request Image Transfer” shortcuts.

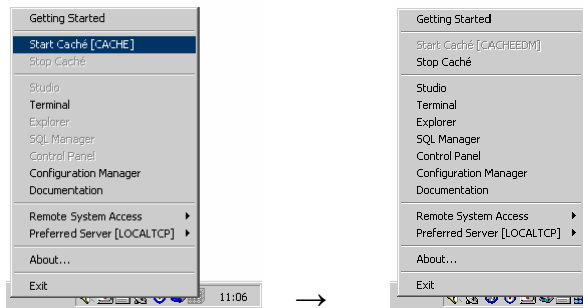
Also, since the PACS is the only acquisition device sending images to VistA, its shortcut has been moved into the DICOM Image Gateway folder.



## 4.2 Starting the Caché Server

The first step in the operation of any component of the VistA Imaging DICOM Gateway is to start the MUMPS Server (Caché Server). Once this program has been started, it should continue to run, until it is explicitly “shut down” (see Section 6.2.7).

Right-click on the icon for the Caché Cube. This action will cause a menu to appear that can be used to manipulate the Caché system, in this case to start Caché. Select **Start Caché**:



**Note:** Once Caché is started, the icon will change color from grey to blue, and the selection of available menu options will change.

## 4.3 Starting a Storage Server for an Instrument

After the Caché Server process has been started, the storage server for each image acquisition device may be started by double clicking on its icon in the DICOM Instruments window. This will launch an instance of the `MAG_CSTORE.EXE` program for each instrument. Upon starting, each `MAG_CSTORE.EXE` will connect to its own MUMPS DICOM storage controller and obtain the specific configuration parameters (the port number, for example) for its instrument.

See the VistA Imaging Error Message Guide for error-conditions that may occur at this stage and how to resolve them.

**Note:** To monitor the MUMPS DICOM Storage Controller, use the Display DICOM Message Log capability (see Section 6.2.2). Messages describing the activity of the `MAG_CSTORE.EXE` program can be displayed using this feature.

Once the `MAG_CSTORE.EXE` program has been started, it starts “listening” on the designated port number, waiting for the acquisition device to send images. Some time later, when the acquisition device is ready to transfer images, it will initiate a TCP/IP connection to the `MAG_CSTORE.EXE` program, establish an association, send one or more images, terminate the association, and then disconnect.

This is what will appear on the monitor when an instrument icon is clicked on:



The port number assigned to the image acquisition instrument, **60100** in this example, is supplied to the `MAG_CSTORE.EXE` program by the MUMPS DICOM storage controller and is specified in the `F:\DICOM\Dict\Instrument.DIC` master file.

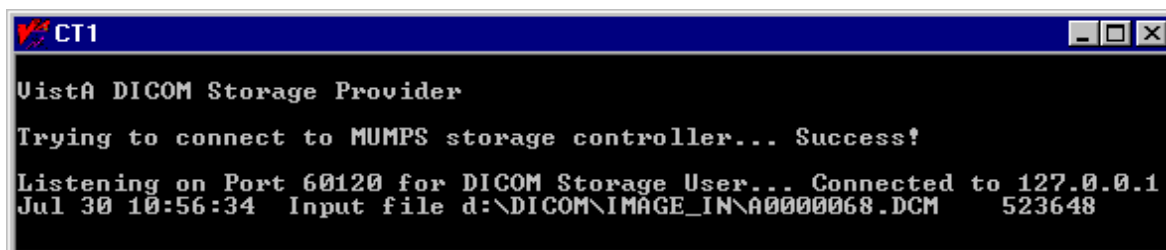
Each time a new image is being received, the MAG\_C-Store program communicates with the MUMPS server to create an entry in the VA-FileMan table **DICOM Raw Image** (stored in `^MAGDINPT(2006.571,...)`). This database contains the full file name (typically in the `D:\DICOM\Image_In` directory), the abbreviation for the instrument that created the image, and a flag that indicates whether the file was received completely. The file name is then passed back to the MAG\_C-Store program, which uses it to save the image.

#### 4.4 Normal Progress

As images are transmitted from an instrument to its Storage Provider, the display in the windows for the providers will start out as:

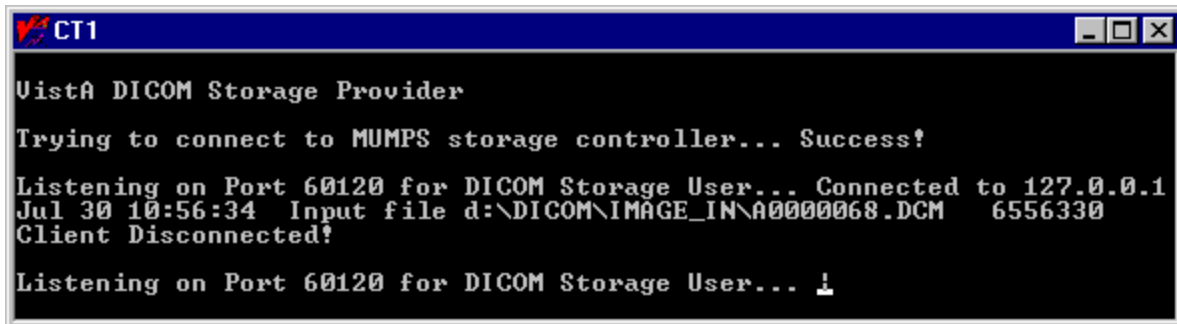


As the image is being received:



After the image is received and the instrument terminates the association:

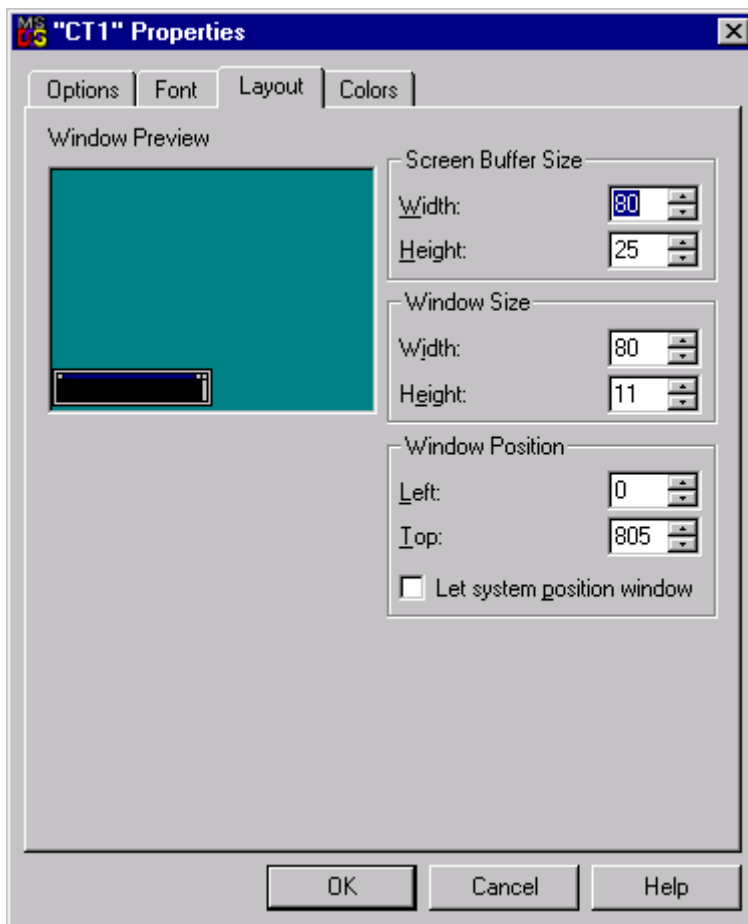




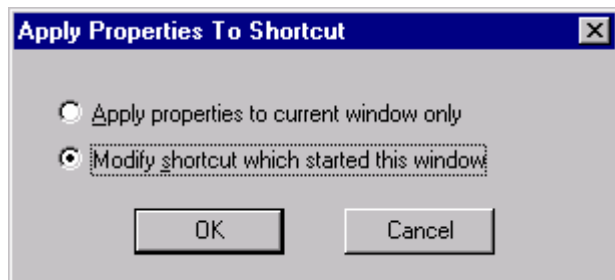
As the images are acquired, they are chronologically stored in sequential files in the image input directory (for example **d:\DICOM\IMAGE\_IN**).

#### 4.5 Sizing and Positioning the Image Acquisition Window

**Note:** The size and location of the each image acquisition window can easily be fixed so that each always appears on the same place on the screen. First manually size and position the window for each instrument on the screen. Second, right-click on the window's active title bar to open the properties window. Click on the "Layout" tab as shown below.



Third, clear the “Let system position window” box and click on “OK”.



The “Apply Properties to Shortcut” window will appear. Check the “Modify shortcut which started this window” option and click on “OK”.

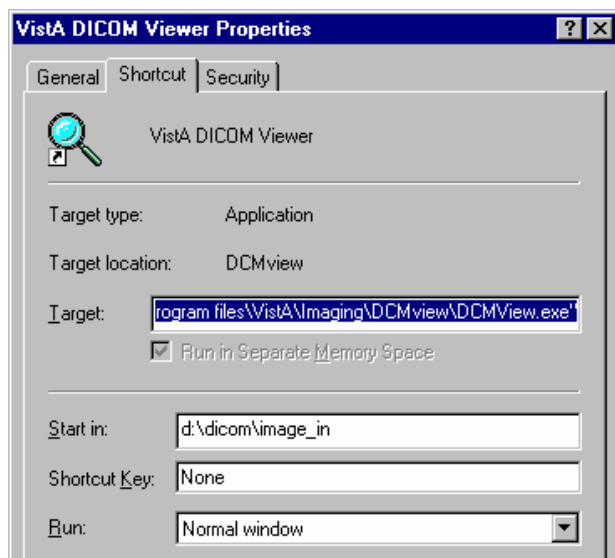
The window properties will then be applied to the shortcut.

#### 4.6 Viewing Images on the Gateway

The **VistA DICOM Viewer** in the DICOM Image Gateway folder displays the images that have been acquired and stored in the **D:\DICOM\Image\_In** directory. This software is provided for the Imaging site support staff to view the image DICOM header information and image display ability, and is generally used when interfacing new image acquisition devices. This software should only be installed on a VistA Imaging DICOM Gateway and not on any Clinical Display workstation.






To facilitate its use, set the “Start In” path on the Properties Shortcut window to **D:\DICOM\Image\_In** as shown below:

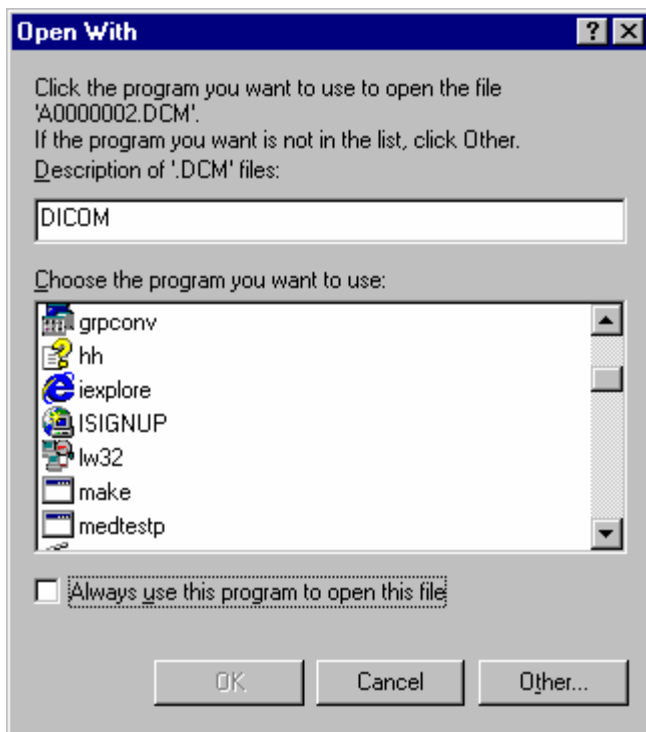


It is also very useful to associate the “.dcm” filename extension with “DICOM” and the VistA **DICOM Viewer**. The procedure for doing this is listed below.

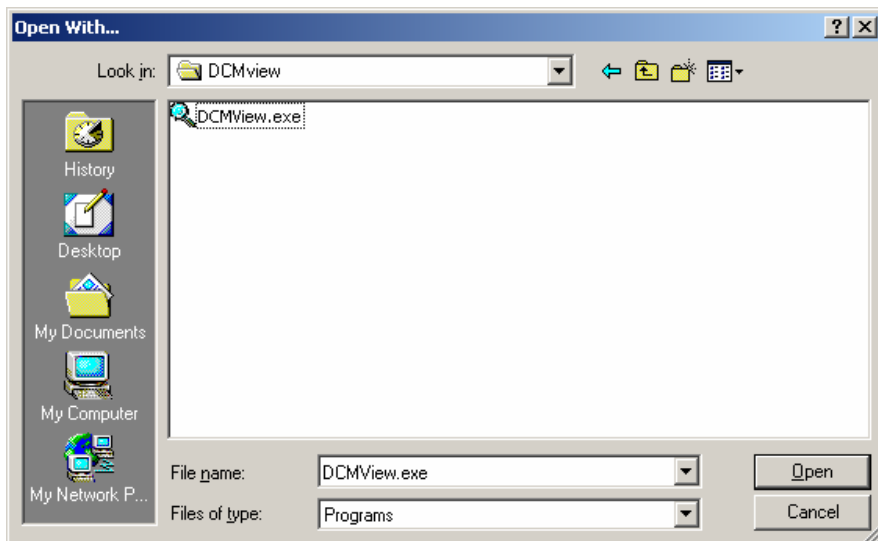
Initially, the \*.dcm files will not be associated, and the Explorer listing will look something like this:

Contents of 'D:\dicom\image_in'					
Name	Size	Type	Modified	Attributes	
 A0000001.dcm	1,051KB	dcm File	4/27/2000 8:30 AM	A	
 A0000002.dcm	1,051KB	dcm File	4/27/2000 8:35 AM	A	
 A0000003.dcm	1,051KB	dcm File	4/27/2000 10:01 AM	A	

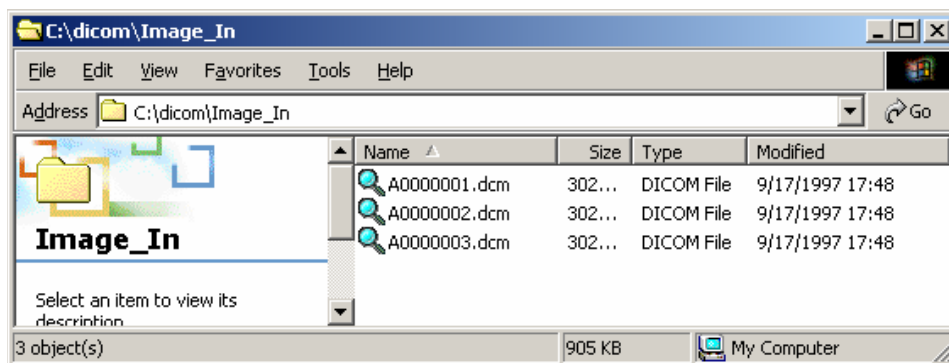
Click on one of the “.dcm” files. The “Open With” window will appear. Enter DICOM as the description of the ‘.dcm’ files.



Then click Other. The “Open With...” window will appear. Select the **c:\program files\VistA\Imaging\DICOM\DCMview\DCMview.exe** program.



After doing these steps, Explorer should identify every DICOM file and always launch the VistA **DICOM Viewer** for every DICOM image.



#### 4.7 Testing the communications

A number of utility programs are available to test and verify that the communication between the various instruments and their storage servers is working. These utility programs are described in Chapter 11.

#### 4.8 Image Gateway Menu

The menu-options for the Image Gateway software are:

1. Receive PACS Exam Complete Messages
2. Send PACS Request Image Transfer Messages
3. Process DICOM Images
4. Increment DICOM Image Input Pointer
5. Display Real-Time Storage Server Statistics

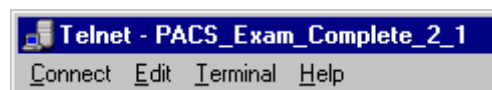
6. Display Cumulative Storage Server Statistics
7. Display Daily Image Processing Statistics
8. Send DICOM Images to Another Storage Server
  1. Select DICOM Images for Transmission
  2. Transmit DICOM Images to a Storage SCP
  3. Stop Image Transmission Queue Processor
  4. (Re)Initialize Image Transmission Queue
9. Display a DICOM Image Header
10. Re-Transmit Images from PACS
  1. Start Querying in PACS
  2. Stop Querying in PACS
  3. Maintain Set-Up Parameters

#### 4.9 Receive PACS Exam Complete Messages

This menu-option is only available when the VistA Imaging DICOM Gateway is configured to receive Exam Complete messages from a commercial PACS. The Exam Complete message signals the gateway to retrieve images from the commercial PACS. (This mechanism is described in detail in Chapter 12.)



When the user double-clicks on the above icon, a telnet window will pop up. The title bar of this window will contain the following text:



A convention throughout the VistA Imaging DICOM Gateway is to use the titles of the telnet windows to specify the name of the task and the sequence numbers of the associated menu-options. In this case, the title is “PACS\_Exam\_Complete\_2\_1”. The task name is “PACS\_Exam\_Complete” and the user selects menu option 2 and then submenu option 1 as follows:

- In the first menu, select #2 (Image Gateway).
- In the second menu, select #1 (Receive PACS Exam Complete Messages).

In practice, the query/retrieve process is commercial PACS implementation-specific, and not totally standardized. The program that is invoked for this menu option is specific to the different kinds of commercial PACSs.

**Note:** See Chapter 12 for the implementation for EMED, GE PACS and other commercial systems using the DICOM protocol, and Chapter 13 for Agfa, CeMax/Icon, Brit and other commercial systems using autorouting with the DICOM MAG\_C-Store protocol.

#### 4.10 Send PACS Request Image Transfer Messages

This menu-option is only available when the VistA Imaging DICOM Gateway is configured to receive Exam Complete messages from a commercial PACS. The Exam Complete message signals the gateway to retrieve images from the commercial PACS.

This menu-option will start a process that will send a C-MOVE request to the PACS to retrieve the images referenced in an “Exam Complete” message (see Section 4.9). These images will be retrieved and transferred to the VistA Storage Server.

Prerequisites:

- Commercial PACS
- VistA Hospital Information System
- Storage Server



When the user double-clicks on the above icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #2 (Send PACS Request Image Transfer Messages).

Ready to issue PACS image transfer requests? y// yes

```
*****
*** Exam Complete Request Handler (Job #20) Started ***
*****
FILE D:\DICOM\Data1\LOGDCM.020\OUTGOING.DCM -- STUDY ROOT Q/R MOVE REQUEST --
```

```
*****
*** User Process Started on MAR 07, 2000 at 13:05:49 ***
*****
```

Connecting to 11.22.33.41 on port 104

```
*****
*** Sending A-ASSOCIATE-REQUEST to EMED_SCP_LAND ***
*****
```

```
PDU Type: 01H (A-ASSOCIATE-RQ)                               Length=258
Version=1   Called AE: "EMED_SCP_LAND"                       Calling AE: "VA VISTA"
ITEM Type: 10H (Application Context Item)                     Length=21
```

```

Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item) Length=46
Presentation Context ID: 1 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=17
Presentation Context: 1.2.840.10008.1.1 (Verification SOP Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 20H (Presentation Context Item) Length=56
Presentation Context ID: 3 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=27
Presentation Context: 1.2.840.10008.5.1.4.1.2.2.2 (Study Root Query/Retrieve
Information Model - MOVE)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 16384
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5

Sending PDU Type: 01H (A-ASSOCIATE-RQ) Length: 258
D:\DICOM\Data1\LOGDCM.020\OUTGOING.PDU
Recving PDU Type: 02H (A-ASSOCIATE-AC) PDU len=205
D:\DICOM\Data1\LOGDCM.020\INCOMING.PDU

```

```

*****
*** Receiving A-ASSOCIATE-RESPONSE on MAR 07, 2000 at 13:05:49 ***
*****

```

```

PDU Type: 02H (A-ASSOCIATE-AC) Length=205
Version=1 Called AE: "EMED_SCP_LAND" Calling AE: "VA VISTA"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 1 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 3 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=50
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 16384
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=20
Implementation Class: 1.2.840.113705.1.100 (** Unknown UID: <<1.2.840.113705.1.100>>
**)
ITEM Type: 55H (Implementation Version Name) Length=14
Implementation Version Name: EMEDDICOM3V100

```

```

Sending PDU Type: 04H (P-DATA-TF) Length: 342 (342)
D:\DICOM\Data1\LOGDCM.020\OUTGOING.DCM PDU len=128 PDV hdr=3, pc=3, len=122
PDU len=226 PDV hdr=2, pc=3, len=220

```

```

Receiving PDU Type: 04H (P-DATA-TF)      PDU len=134   PDV hdr=3, pc=3, len=128
D:\DICOM\Data1\LOGDCM.020\INCOMING.DCM
Reading D:\DICOM\Data1\LOGDCM.020\INCOMING.DCM
*****
***  C-MOVE Response Received  Status=0  R:0  C:26  F:0  W:0  ***
*****

Sending PDU Type: 05H (A-RELEASE-RQ)  Length: 4
D:\DICOM\Data1\LOGDCM.020\OUTGOING.PDU
Receiving PDU Type: 06H (A-RELEASE-RP)  PDU len=4
D:\DICOM\Data1\LOGDCM.020\INCOMING.PDU

```

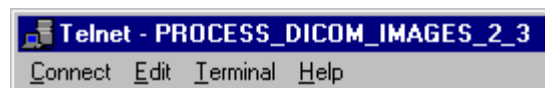
## 4.11 Process DICOM Images

Images that have been acquired must be associated with the corresponding patient and study in the VistA medical record. The “Process DICOM Images” task makes this association and inserts information about each image into the database. A different process will copy the image files to permanent storage on a jukebox.

For DICOM image files to be properly associated with the correct patient and study on the VistA patient database, the header of each image file must contain the right values for the patient name, patient identification, and accession number.



When the user double-clicks on the icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #3 (Process DICOM Images).

**Note:** This option should always be running on the DICOM Image Gateway.

### 4.11.1 Software Steps in Processing a DICOM Image

This task processes the images that were obtained from the acquisition instruments (see Section 4.3) and are referenced in DICOM RAW IMAGE File (#2006.571) (stored in ^MAGDINPT( 2006.571, ... ) ). The program loops through the following steps:

1. Obtain the pointer to the next entry to process from ^MAGDINPT( 2006.571, "ACOUNT" ).
2. If that image file is not “complete” wait for a maximum of five minutes. If, after five minutes, the file is still not completed, then add an entry to DICOM INCOMPLETE IMAGE File (#2006.593)( stored in ^MAGD( 2006.593, ... ) ) for later processing, update the counter in ^MAGDINPT( 2006.571, "ACOUNT" ), and start another iteration of the



processing loop (go back to step 1). The name of the file is changed by appending “INCOMPLETE” to the name-extension.

3. Assuming that the image file is complete, read the information in the header of the DICOM file and extract the information that identifies the modality (manufacturer, model and model name), patient (demographics), study, and image.

When the VistA DICOM Image Gateway attempts to “process” an image, it tries to extract these values from the image header. Since not all image acquisition modalities place the accession number value in the proper DICOM element (0008,0050), “processing an image” first involves trying to figure out what kind of a modality created the image and determining where it put the accession number. This mapping for the image acquisition device is defined in the file **F:\DICOM\Dict\Modality.DIC**. (If this mapping does not exist, the process is terminated and a pointer to the image is placed in the FileMan table “DICOM Undefined Modalities” (stored in ^MAGD( 2006.5712, ...)).)

4. If the VistA database already contains the image (that is, the Image Instance UID is already present), display an error message, delete the image file from the input directory, update the ^MAGDINPT( 2006.571, “ACOUNT” ) counter, and start another iteration of the processing loop (go back to step 1).
5. If the modality cannot be found in the RADIOLOGY MODALITY INSTRUMENT File (#2006.582) (stored in ^MAGDICOM( 2006.582, ...)), add an entry to the DICOM UNDEFINED MODALITIES File (#2006.5712) (stored in ^MAGD( 2006.5712, ...)) for later processing, update the counter in the DICOM RAW IMAGE File (#2006.571) (stored in ^MAGDINPT( 2006.571, “ACOUNT” )), and start another iteration of the processing loop (go back to step 1). Undefined modalities will be listed in the storage server statistics (see Section 4.13).
6. Each image acquisition instrument is mapped to a specific medical service (like radiology or consults). The patient and study are looked up on that service using the name, identification, and accession number. If the proper study is found, an association is created between the image and the corresponding study.  
Check whether the accession number that is provided by the modality is stored in the VistA database.
7. If the accession number is not found in the VistA database, then add the image file reference to the DICOM FAILED IMAGES File (#2006.575) (stored in ^MAGD( 2006.575, ...)), for manual correction (see Chapter 7 Correcting DICOM Failed Images), update the counter in the DICOM RAW IMAGE File (#2006.571) (stored in ^MAGDINPT( 2006.571, “ACOUNT” )), and start another iteration of the processing loop (go back to step 1). Image files that fail to be matched to the corresponding patient and study are reported in the storage server statistics (see Section 4.13).
8. Check whether the name of the patient that is provided by the commercial PACS or the modality corresponds to the name stored in the VistA database for the accession number in

question. This check is based on the full name of the patient. The check allows for the possibility that characters are transposed. The last name and the first six characters of the first name must match. The middle initial, if provided, must match.

9. Check whether the social security number corresponds to the number stored in the VistA database. This check allows for the possibility that digits are transposed.
10. If a matching entry in the VistA database cannot be found, then add the image file reference to the DICOM FAILED IMAGES File (#2006.575) (stored in ^MAGD( 2006 . 575 , ... )), for manual correction (see Chapter 7 Correcting DICOM Failed Images), update the counter in the DICOM RAW IMAGE File (#2006.571) (stored in ^MAGDINPT( 2006 . 571 , "ACOUNT" )), and start another iteration of the processing loop (go back to step 1). Image files that fail to be matched to the corresponding patient and study are reported in the storage server statistics (see Section 4.13).
11. Otherwise, create an entry in the IMAGE File (#2005) (stored in ^MAG( 2005 , ... )).
12. Update the image pointer in the corresponding “parent report file” (one of Radiology or Medicine).
13. Create derived files (**.BIG**, **.TGA**, and **.ABS**). TGA, ABS, BIG, and TXT are created on the DICOM Gateway, each with an image size. The images are transmitted to the RAID image server with a request placed for the return of the size of each of the transmitted images, which is compared with the calculated image sizes. If the numbers agree, the transmission is considered successful and steps 14 and 15 will be executed.
14. Add entries to the “copy file to jukebox” background processor queue.
15. Delete the image file in D:\DICOM\Image\_In.
16. Update the counter in ^MAGDINPT( 2006 . 571 , "ACOUNT" ) .
17. Process completed entries in the DICOM INCOMPLETE IMAGE File (#2006.5713) (stored in ^MAGD( 2006 . 5713 , ... )). If entries in this file are over an hour old, delete the image file from the directory D:\DICOM\Image\_In.
18. Process completed entries in the DICOM UNDEFINED MODALITIES File (#2006.5712) (stored in ^MAGD( 2006 . 5712 , ... )).
19. Process completed entries in the DICOM FAILED IMAGES File (#2006.575) (stored in ^MAGD( 2006 . 575 , ... )).
20. Go back to step 1.

### 4.11.2 Operational Details of DICOM Image Processing

When the association is created, the VistA image file name is assigned to the image file, it is "processed", and the resulting images are stored.

**Note:** The patient name and patient id (social security number) may either be display or hidden, depending upon the setting of the Display Patient Name/ID in Image Processing? switch in the gateway configuration.

```
Ready to process DICOM Images and send them to VistA? y// <Enter> Yes
```

```
M0000114.DCM -- IMAGPATIENT,ONE M. -- 000-01-9676 -- G MRC-154      (with name and id displayed)
M0000114.DCM -- ****,* -- ***-**-**** -- GMRC-154      (with name and id suppressed)
  DEL d:\DICOM\IMAGE_IN\TMP_IMAGE.TGA
  MAG_DCMTOTGA d:\DICOM\IMAGE_IN\M0000114.DCM d:\DICOM\IMAGE_IN\TMP_IMAGE.TGA X576 Y456 O1598 B8
F0 C255
COPY d:\DICOM\IMAGE_IN\TMP_IMAGE.TGA \isw-imgqadb\image1$\DE\00\38\DE003841.TGA
  1)          1 file(s) copied.
DEL d:\DICOM\IMAGE_IN\TMP_IMAGE.ABS
MAG_ABSTRTGA d:\DICOM\IMAGE_IN\TMP_IMAGE.TGA d:\DICOM\IMAGE_IN\TMP_IMAGE.ABS /8
COPY d:\DICOM\IMAGE_IN\TMP_IMAGE.ABS \isw-imgqadb\image1$\DE\00\38\DE003841.ABS
  1)          1 file(s) copied.
DEL d:\DICOM\IMAGE_IN\TMP_TEXT.TXT
COPY d:\DICOM\IMAGE_IN\TMP_TEXT.TXT \isw-imgqadb\image1$\DE\00\38\DE003841.TXT
  1)          1 file(s) copied.
DEL d:\DICOM\IMAGE_IN\M0000114.DCM
```

### 4.12 Increment DICOM Image Input Pointer

On rare occasions, a garbled image may be transmitted to the Image Gateway, which would cause image processing to stop. In order to continue operations, the corrupted image file can be manually bypassed with this function.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #4 (Increment DICOM Image Input Pointer).

The last image in the "D:\DICOM\Image\_In" directory is number 3.

There are no images waiting to be processed.

The current image processing pointer value is 1.

```
Do you wish to increment the image processing pointer? n// y - INCREMENTED
```

### 4.13 Display Storage Server Statistics in Real-Time

The “Display Real-Time Storage Server Statistics” option is used to monitor the results of the DICOM image processing task and to detect problems in the workflow. The option should be run continuously.



When the user double-clicks on the above icon, a telnet window will pop up. The title bar of this window will contain the following text:



Follow the convention to select:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #5 (Display Real-Time Storage Server Statistics).

The Image Status application displays the number of...

- Image files that have been completely processed and stored in VistA
- Images that failed because of patient/study information mismatch
- Images that failed because the image acquisition modality was not defined in **F:\DICOM\Dict\Modality.DIC**

The list of “Instruments” that is presented is defined in the master file named **F:\DICOM\Dict\Instrument.DIC**.

After starting this process, the screen display will look like this:

```
Ready to output instrument statistics? y// yes
```

#### VISTA DICOM Image Storage Server

Instrument	Description	Port	Service
-----	-----	----	-----
CR1	Fuji AC3 CR, Radiology	60050	RAD
CT1	Picker PQ 5000, Room 2142	60060	RAD
LUMISYS	Lumisys Scanner, Radiology	60110	RAD
LUMISYS_TOP	Lumisys Scanner, Topeka Radiology	60111	RAD
US	Acuson Sequoia, Rm 2136	60090	RAD

#### VISTA DICOM Image Storage Server Status

Instrument	Interface Status	Associations	Images	(Time)
CR1	Up (since 06/03)			
CT1	Up (since 06/03)	(active)	273	(11:51)
LUMISYS	Down 12:50 02/11			
LUMISYS_TOP	Down 12:50 02/11			
US	Down 12:50 02/11			

984.5 megabytes (66.9%) of free space on drive d: (Total=1472.5 megabytes)

Exit? no //

In the above example, the VistA DICOM Storage Provider has been operational for the CR1 and CT1 modalities since 06/03, but has not been used for the other three modalities since 02/11. There is currently an active DICOM association between the CT1 modality and its VistA DICOM Storage Provider, and it is probably sending images. A total of 273 images have been acquired from the CT1 modality today, the last at 11:51.

Every 30 seconds an updated set of statistics will be displayed. After each set of statistics, the program will ask whether or not to exit. If this question is not answered with “Yes”, the program will continue indefinitely.

Some images may be waiting to be processed, because the patient or study information was entered incorrectly on the instrument (see Chapter 10) or because the instrument was not yet defined.

The VistA Imaging DICOM Gateway system may not be able to process certain images because the image parameters are not defined in the **F:\DICOM\Dict\Modality.DIC** master file. An error message like the following may be displayed:

```

*** The following images have undefined modalities ***
Manufacturer      Model      Modality  #Images
-----
VAMC Image Acquisition  VA Image Camera      OT      1

```

When this happens, the modality needs to be added to the dictionary (see Chapter 10.)

#### 4.14 Display Cumulative Storage Server Statistics

This option provides the daily totals of images acquired from the various instruments. It can be run at any time.

Use the Caché Terminal icon to start a session for this menu option.



Caché  
Terminal

After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #6 (Display Cumulative Storage Server Statistics).

The numbers in the report represent the daily totals of images acquired from the various instruments.

```

                                IMAGE CAPTURE STATISTICS BY MODALITY

                                L
                                U
                                M
                                I
                                S
                                C
                                C
                                R   T   Y
                                1   1   S
DATE  =====
02/13/98                2
04/20/98                3
04/21/98               14
07/16/98             21
07/17/98             40
07/18/98              4
. . .
05/31/99             40
06/01/99            134   250
06/02/99            125   296
06/03/99            109    56

```

Push <Enter> to continue...

#### 4.15 Display Daily Image Processing Statistics

This option allows the user to quickly assess any delay or problems in processing images. The numbers shown represent the numbers of individual images, not exams.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #7 (Display Daily Image Processing Statistics).

The numbers in this report represent images acquired and processed from the various instruments, and the time stamp for the most recent image.

#### VISTA DICOM Image Storage Server Statistics

Please enter beginning date: T // <Enter>

#### VISTA DICOM Image Storage Server Statistics for 06/10/99

Modality	Images Acquired	Images Processed
-----	-----	-----
CR1	44 (12:42)	44 (12:43)
PB_CT	99 (10:06)	156 (10:25)

Exit? no //

**Note:** The number of images processed may be different than the number of images acquired, because of delays introduced by studies that have inaccurate patient information and need to be manually corrected (see Chapter 7).

### 4.16 Send DICOM Images to Another Storage Server

Images can be sent from VistA to another DICOM storage provider, like a commercial PACS, workstation, radiation therapy planning device, etc.

Sending images to another storage server is a two-step process involving separate image/study selection and transmission steps. There are two different selection methodologies. The first (menu option 1 below) allows the user to select individual images/studies for transmission. The second (menu option 5 below) allows groups of studies to be exported as a batch.

#### DICOM Export Menu Options

1. Select DICOM Images for Transmission
2. Transmit DICOM Images to a Storage SCP
3. Stop Image Transmission Queue Processor
4. (Re)Initialize Image Transmission Queue
5. Batch Export VistA Radiology Images
6. Display Batch Export Statistics

The selection step can be initiated from any PC that has the VistA Imaging DICOM Gateway software available; the transmission step (menu option 2 above) can only be run on PCs that are set up to transmit files to the designated DICOM storage server.

Before performing the DICOM Export, the destination DICOM storage providers must be setup as described in the VistA Imaging DICOM Installation Guide. Their AE Titles, IP addresses, and port numbers must be in the **D:\DICOM\Dict\SCU\_List.DIC** master file and in the USER APPLICATION File (#2006.585, stored in the ^MAGDICOM(2006.585) global). After modifications have been made to the master file, this file needs to be re-imported into the active database using the menu option #6 - Update SCU\_List.DIC (see section 6.3.6).

### 4.16.1 Select DICOM Images for Transmission

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #1 (Select DICOM Images for Transmission).

This program will enter image files into a transmission queue in the DICOM IMAGE OUTPUT File (#2006.574) (stored in ^MAGDOUTP ( 2006 . 574 , ... )).

In order to select an image for transmission, either the case number or the internal image number may be entered. If an image number is entered, it must be preceded by a “tick mark” (accent grave).

Select images to send via DICOM

All uses pose potential violations of patient privacy.

It is absolutely required that all users with transmission capability personally inspect each downloaded image.

For technical reasons, related to the image capture process, some of the images contain patient identification data which must be removed manually.

Each image transmitted is tracked and audited by the Imaging System.

The images are not to be distributed outside of the VA, or used for any other purposes than listed below.

The transmitting user is specifically responsible for the protection of these images.

Press <Enter> to continue: **<Enter>**

Indicate the reason for transmission:

- [a] Clinical care for the patient whose images are being transmitted
- [b] Clinical care for other VA patients
- [c] Use in approved research by VA staff
- [d] Approved teaching purposes by VA staff



[e] Use in approved VA publications

[f] Clinical care (Export to HIPAA Compliant Archive)

Enter letter for reason: **A** <Enter>

Enter electronic signature: xxx <Enter>

Specify RADIOLOGY or CONSULT examination (R or C): R// <Enter> **R**

Enter Case Number (or `ien): **26** <Enter> ??? report does not exist

Press <Enter> to try another case number... <Enter>

Select images to send via DICOM

Enter Case Number (or `ien): **102197-57** <Enter>

Image File Information

-----

Number: 50215                  Accession Number: 102197-57  
 Name: "IMAGPATIENT,SIX R. 000086293 CHEST 2 VIEWS PA&LAT"  
 Object: XRAY GROUP                  Image Type: RAD CT  
 Image Name: "CHEST 2 VIEWS PA&LAT"  
 Study UID: 2.16.840.1.113662.2.1.483644493333.429.33.9159  
 There are 3 images in this group:  
     50216    50217    50218

Is this the correct image? n// **y** <Enter>

DICOM Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST
- 3 -- VISTA PACS TEXT GATEWAY EXERCISER

Select the provider application (1-3): **1** <Enter>

Send the images to LOCAL IMAGE STORAGE? n// **y** <Enter> -- images will be sent

Press <Enter> to continue... <Enter>

Ready to select studies to send via DICOM? y// <Enter> Yes

Select images to send via DICOM

Enter Case Number (or `ien): **`50216** <Enter>

Image File Information

-----

Number: 50216  
 Name: "IMAGPATIENT,SIX R. 000086293 CHEST 2 VIEWS PA&LAT"  
 Object: DICOM IMAGE                  Image Type: CT  
 Image Name: "CHEST 2 VIEWS PA&LAT (#1)"  
 GROUP #: 50215  
 Image UID: 2.16.840.1.113662.2.1.429.19961105.203459.9300

Is this the correct image? n// y <Enter>

DICOM Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST
- 3 -- VISTA PACS TEXT GATEWAY EXERCISER

Select the provider application (1-3): 1 <Enter>

Send the images to LOCAL IMAGE STORAGE? n// y <Enter> -- images will be sent

Push <Enter> to continue... <Enter>

Select images to send via DICOM

Enter Case Number (or `ien): `50217 <Enter>

Image File Information

-----

Number: 50217  
Name: "IMAGPATIENT,SIX R. 000086293 CHEST 2 VIEWS PA&LAT"  
Object: XRAY Image Type: CT  
Image Name: "CHEST 2 VIEWS PA&LAT (#2)"  
GROUP #: 50215  
Image UID: 2.16.840.1.113662.2.1.429.19961105.203459.9300

Is this the correct image? n// y <Enter>

DICOM Service Class Providers

-----

- 1 -- LOCAL IMAGE STORAGE
- 2 -- LOCAL MODALITY WORKLIST
- 3 -- VISTA PACS TEXT GATEWAY EXERCISER

Select the provider application (1-3): 1 <Enter>

Send the images to LOCAL IMAGE STORAGE? n// y <Enter> -- images will be sent

Push <Enter> to continue... <Enter>

Select images to send via DICOM

Enter Case Number (or `ien): `50218 <Enter>

Image File Information

-----

Number: 50218  
Name: "IMAGPATIENT,SIX R. 000086293 CHEST 2 VIEWS PA&LAT"  
Object: XRAY Image Type: CT  
Image Name: "CHEST 2 VIEWS PA&LAT (#3)"  
GROUP #: 50215  
Image UID: 2.16.840.1.113662.2.1.429.19961105.203459.9300

Is this the correct image? n// y <Enter>

DICOM Service Class Providers

```

-----
1 -- LOCAL IMAGE STORAGE
2 -- LOCAL MODALITY WORKLIST
3 -- VISTA PACS TEXT GATEWAY EXERCISER

Select the provider application (1-3): 1 <Enter>

Send the images to LOCAL IMAGE STORAGE? n// y <Enter> -- images will be sent
Push <Enter> to continue... <Enter>

Select images to send via DICOM

Enter Case Number (or `ien): <Enter>

```

#### 4.16.2 Transmit DICOM Images to a Storage SCP

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #2 (Transmit DICOM Images to a Storage SCP).

Files that have been entered into the transmission queue in the DICOM IMAGE OUTPUT File (#2006.574)(stored in ^MAGDOUTP ( 2006 . 574 , ... )) are transmitted to their destinations using this menu-option. Once this program is started, it runs continuously.

Vista DICOM image transmission is a two-step process. First the DICOM image has to be reconstituted from the TARGA™ image and the corresponding text file. (This is performed by MUMPS and the MAG\_DCMTOTGA.EXE program.) The regenerated DICOM image is stored in the D:\DICOM\Image\_Out directory. Then a MAG\_VISTA\_SEND\_IMAGE.EXE process is started to create an association to the destination storage server and transmit the images. When images are stored internally in DICOM format, the “reconstitution step” is skipped, but the images will still be copied to the D:\DICOM\Image\_Out directory. Patient demographics are updated before the image is sent out.

The dialog below shows the transmission of the images selected in the example in Section 4.16.1.

```
Ready to send DICOM Images from Vista? y// yes <Enter>
```

```

COPY \\VHAISWIM1\IMAGE1$\CT_TEST.DCM D:\DICOM\Image_Out\CT_TEST.DCM
1) 1 file(s) copied.
*****

```

```

*** Send Image (Job #5) Started on JUL 22, 1999 at 10:36:26 ***
*****
MAG_VISTA_SEND_IMAGE LOCALHOST 10005

Socket Available on Port 10005
Recving <<Connection established to MUMPS>>
Sending <<CONNECT LOCALHOST 60100>>
Recving <<CONNECTION SUCCESSFUL>>
*****
*** Sending A-ASSOCIATE-REQUEST to Vista_Storage ***
*****

PDU Type: 01H (A-ASSOCIATE-RQ)                                Length=208
Version=1   Called AE: "Vista_Storage"      Calling AE: " Vista Testing"
ITEM Type: 10H (Application Context Item)    Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item)   Length=56
Presentation Context ID: 1      Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=25
Presentation Context: 1.2.840.10008.5.1.4.1.1.2 (CT Image Storage)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=19
Transfer Syntax: 1.2.840.10008.1.2.1 (Explicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item)       Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5
Sending <<NEW_ASSOCIATION D:\DICOM\Image_Out\ASSOCIAT.OUT D:\DICOM\Image_Out\ASSOCIAT.IN>>
Recving <<ASSOCIATION ACKNOWLEDGE>>

*****
*** Receiving A-ASSOCIATE-RESPONSE on JUL 22, 1999 at 10:36:27 ***
*****

PDU Type: 02H (A-ASSOCIATE-AC)                                Length=179
Version=1   Called AE: "Vista_Storage"      Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item)    Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item)   Length=27
Presentation Context ID: 1      Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=19
Transfer Syntax: 1.2.840.10008.1.2.1 (Explicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item)       Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5

Image 1/1: D:\DICOM\Image_Out\CT_TEST.DCM on JUL 22, 1999 at 10:36:27
Sending <<SEND_IMAGE D:\DICOM\Image_Out\COMMAND.DCM D:\DICOM\Image_Out\CT_TEST.D
CM 32768 338 D:\DICOM\Image_Out\RESPONSE.DCM>>
Recving <<IMAGE SENT>> (not on file)
Sending <<END_ASSOCIATION D:\DICOM\Image_Out\RELEASE.OUT D:\DICOM\Image_Out\RELE
ASE.IN>>
Recving <<ASSOCIATION ENDED>>

```

```

Sending <<END_SESSION>>
MAG_TGATODCM \\VHAISWIMM1\IMAGE1$\LA050217.TGA D:\DICOM\Image_Out\LA050217.DCM 524288
*****
*** Send Image (Job #5) Started on JUL 22, 1999 at 10:36:29 ***
*****
MAG_VISTA_SEND_IMAGE LOCALHOST 10005

Socket Available on Port 10005
Recving <<Connection established to MUMPS>>
Sending <<CONNECT LOCALHOST 60100>>
Recving <<CONNECTION SUCCESSFUL>>
*****
*** Sending A-ASSOCIATE-REQUEST to Vista_Storage ***
*****

PDU Type: 01H (A-ASSOCIATE-RQ) Length=206
Version=1 Called AE: "Vista_Storage" Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item) Length=54
Presentation Context ID: 1 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=25
Presentation Context: 1.2.840.10008.5.1.4.1.1.2 (CT Image Storage)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5
Sending <<NEW_ASSOCIATION D:\DICOM\Image_Out\ASSOCIAT.OUT D:\DICOM\Image_Out\ASSOCIAT.IN>>
Recving <<ASSOCIATION ACKNOWLEDGE>>

*****
*** Receiving A-ASSOCIATE-RESPONSE on JUL 22, 1999 at 10:36:30 ***
*****

PDU Type: 02H (A-ASSOCIATE-AC) Length=177
Version=1 Called AE: "Vista_Storage" Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 1 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5

Image 1/1: D:\DICOM\Image_Out\LA050217.DCM on JUL 22, 1999 at 10:36:30
Sending <<SEND_IMAGE D:\DICOM\Image_Out\COMMAND.DCM D:\DICOM\Image_Out\LA050217.DCM 32768 0 D:\DICOM\Image_Out\RESPONSE.DCM>>

```

```

Recving <<IMAGE SENT>> (not on file)
Sending <<END_ASSOCIATION D:\DICOM\Image_Out\RELEASE.OUT D:\DICOM\Image_Out\RELEASE.IN>>
Recving <<ASSOCIATION ENDED>>
Sending <<END_SESSION>>
MAG_TGATODCM \\VHAISWIMM1\IMAGE1$\LA050218.TGA D:\DICOM\Image_Out\LA050218.DCM 524288
*****
*** Send Image (Job #5) Started on JUL 22, 1999 at 10:36:32 ***
*****
MAG_VISTA_SEND_IMAGE LOCALHOST 10005

Socket Available on Port 10005
Recving <<Connection established to MUMPS>>
Sending <<CONNECT LOCALHOST 60100>>
Recving <<CONNECTION SUCCESSFUL>>
*****
*** Sending A-ASSOCIATE-REQUEST to Vista_Storage ***
*****

PDU Type: 01H (A-ASSOCIATE-RQ) Length=206
Version=1 Called AE: "Vista_Storage" Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item) Length=54
Presentation Context ID: 1 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=25
Presentation Context: 1.2.840.10008.5.1.4.1.1.2 (CT Image Storage)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5
Sending <<NEW_ASSOCIATION D:\DICOM\Image_Out\ASSOCIAT.OUT D:\DICOM\Image_Out\ASSOCIAT.IN>>
Recving <<ASSOCIATION ACKNOWLEDGE>>

*****
*** Receiving A-ASSOCIATE-RESPONSE on JUL 22, 1999 at 10:36:32 ***
*****

PDU Type: 02H (A-ASSOCIATE-AC) Length=177
Version=1 Called AE: "Vista_Storage" Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 1 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=22
Implementation Class: 1.2.840.113754.2.1.1.0 (VA DICOM V2.5)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: VA DICOM V2.5

```

```

Image 1/1: D:\DICOM\Image_Out\LA050218.DCM on JUL 22, 1999 at 10:36:32
Sending <<SEND_IMAGE D:\DICOM\Image_Out\COMMAND.DCM D:\DICOM\Image_Out\LA050218.
DCM 32768 0 D:\DICOM\Image_Out\RESPONSE.DCM>>
Recving <<IMAGE SENT>> (not on file)
Sending <<END_ASSOCIATION D:\DICOM\Image_Out\RELEASE.OUT D:\DICOM\Image_Out\RELE
ASE.IN>>
Recving <<ASSOCIATION ENDED>>
Sending <<END_SESSION>>/
^C
*** Error: ,Z<INRPT>XXX^MAGDXXX:::6:0:, ***

```

When all files are transmitted, this menu-option may be terminated by pressing **Control-C**, as shown above.

The details of the above log require a working knowledge of the DICOM Standard (PS 3.7-1999), as well as familiarization with the VistA Imaging DICOM Gateway implementation. It is more useful for support personnel.

### 4.16.3 Stop Image Transmission Queue Processor

When a transmission queue processor has been started using the menu option from 4.16.2, this processor will continue until instructed to stop using this menu option.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #3 (Stop Image Transmission Queue Processor).

When this menu option is selected, the Image Transmission Queue processor that was started (in a different Telnet window) will stop; the program will acknowledge the request by displaying:

The transmitter will stop soon.

### 4.16.4 Initialize Image Transmission Queue

If a communication error occurs, the transmission queue will have to be reinitialized.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #4 (Initialize Image Transmission Queue).

```
Initialize Image Transmission Queue?  n// y <Enter>
```

```
Image Transmission Queue has been initialized
```

```
Push <Enter> to continue...
```

#### 4.16.5 Batch Export VistA Radiology Images

Batch Export allows a multiple Radiology studies to be exported at one time. This may be by a date range, radiology report number range, or by a selected patient. The first two capabilities can be used to transfer images from VistA to a commercial PACS, while the third can be used to transfer multiple studies to a DICOM CD burner. The examples below show all three scenarios.

##### 4.16.5.1 Batch Export of Radiology Images by Date Range

This capability is used to export a set of Radiology images for a given Radiology Report date range. The user establishes the date range and indicates whether the studies should be exported in ascending (chronological) or descending (reverse chronological) order. It is also allow the user to determine when to run the Batch Export process, perhaps only during the off-hours. This capability is useful for exporting a set of studies to a commercial PACS.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #5 (Batch Export VistA Radiology Images).

This program will enter image files into a transmission queue in the DICOM IMAGE OUTPUT File (#2006.574) (stored in ^MAGDOUTP( 2006.574 , ... )).

```
*****
***
*** V i s t A   D I C O M   I m a g e   E x p o r t e r
*** -----
***
*** This program may be used to copy radiology images from VistA to a
*** another DICOM image archive.
***
```



```

***
*** The regular "Transmit DICOM Images to a Storage SCP" menu option
*** is used to copy the images to the other DICOM image archive.
*** You may use Ctrl-C (^C) to stop this process, if you need to abort it.
***
*****

```

Scan by Date, Report Number, or Patient (D, N, or P): **DATE <Enter>**

All uses pose potential violations of patient privacy.

It is absolutely required that all users with transmission capability personally inspect each downloaded image.

For technical reasons, related to the image capture process, some of the images contain patient identification data which must be removed manually.

Each image transmitted is tracked and audited by the Imaging System.

The images are not to be distributed outside of the VA, or used for any other purposes than listed below.

The transmitting user is specifically responsible for the protection of these images.

Press <Enter> to continue: **<Enter>**

Indicate the reason for transmission:

- [a] Clinical care for the patient whose images are being transmitted
- [b] Clinical care for other VA patients
- [c] Use in approved research by VA staff
- [d] Approved teaching purposes by VA staff
- [e] Use in approved VA publications
- [f] Clinical care (Export to HIPAA Compliant Archive)

Enter letter for reason: **A <Enter>**

Enter electronic signature: xxx **<Enter>**

The DICOM storage provider is "LOCAL PACS SIMULATOR".

Do you wish to change it? n // **<Enter>** n

The radiology reports will be scanned in the "ASCENDING" order.

Do you wish to change it? n // **<Enter>** n

Enter the earliest date for the report.

Earliest Report Date: NOV 24, 1998// **<Enter>** (NOV 24, 1998)

Enter the latest date for the report.

Latest Report Date: FEB 23, 2006@23:59// **<Enter>** (FEB 23, 2006@23:59)

```
The active hours of operation are indicated below with a "Y"
      M12345678901N12345678901 (M=midnight, N=noon)
Active hours are: YYYYYYYYYYYYYYYYYYYYYYYY

Do you wish to change these hours? n // <Enter>    n
```

```

      F i n a l   P a r a m e t e r   C h e c k l i s t
      -----
DICOM storage provider: LOCAL PACS SIMULATOR
Report scanning order: ASCENDING
Earliest date for report: NOV 24, 1998
Latest date for report: FEB 23, 2006@23:59
Active hours of operation: M12345678901N12345678901 (M=midnight, N=noon)
                          YYYYYYYYYYYYYYYYYYYYYYYY

Ready to begin exporting DICOM images? Y

Report #   Accession   Group #   #Images   Date
-----   -
      28 : 112498-19         318        27 images   NOV 24, 1998-
```

#### 4.16.5.2 Batch Export of Radiology Images by Report Number

This capability is used to export a set of Radiology images by the Radiology Report number. The user establishes the initial report number and how many to export. The user indicates whether the studies should be exported in ascending (chronological) or descending (reverse chronological) order. It is also allow the user to determine when to run the Batch Export process, perhaps only during the off-hours. This capability is useful for exporting a set of studies to a commercial PACS.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #5 (Batch Export VistA Radiology Images).

This program will enter image files into a transmission queue in the DICOM IMAGE OUTPUT File (#2006.574) (stored in ^MAGDOUTP( 2006.574 , ...)).

```

*****
***
*** V i s t A   D I C O M   I m a g e   E x p o r t e r
*** -----
***
*** This program may be used to copy radiology images from VistA to a
*** another DICOM image archive.
***
```

```

***
*** The regular "Transmit DICOM Images to a Storage SCP" menu option
*** is used to copy the images to the other DICOM image archive.
*** You may use Ctrl-C (^C) to stop this process, if you need to abort it.
***
*****

```

Scan by Date, Report Number, or Patient (D, N, or P): **NUMBER <Enter>**

All uses pose potential violations of patient privacy.

It is absolutely required that all users with transmission capability personally inspect each downloaded image.

For technical reasons, related to the image capture process, some of the images contain patient identification data which must be removed manually.

Each image transmitted is tracked and audited by the Imaging System.

The images are not to be distributed outside of the VA, or used for any other purposes than listed below.

The transmitting user is specifically responsible for the protection of these images.

Press <Enter> to continue: **<Enter>**

Indicate the reason for transmission:

- [a] Clinical care for the patient whose images are being transmitted
- [b] Clinical care for other VA patients
- [c] Use in approved research by VA staff
- [d] Approved teaching purposes by VA staff
- [e] Use in approved VA publications
- [f] Clinical care (Export to HIPAA Compliant Archive)

Enter letter for reason: **a <Enter>**

Enter electronic signature: xxx **<Enter>**

The DICOM storage provider is "LOCAL PACS SIMULATOR".

Do you wish to change it? n // **<Enter>** n

The radiology reports will be scanned in the "ASCENDING" order.

Do you wish to change it? n // **<Enter>** n

Scanning will start with radiology report # "100".

Do you wish to change it? n // **y <Enter>**

The first radiology report is #1 (061390-3) entered on JUN 13, 1990.  
The last radiology report is #201 (110403-267) entered on NOV 04, 2003.

Enter the new value of the radiology report #: 100 // **1 <Enter>**

Radiology report #1 (061390-3) entered on JUN 13, 1990.

Is this where to begin scanning? n // **y <Enter>** -- changed

This run will try to export images for 10 studies.  
(Studies without images will not be included in this count.)

Do you wish to change this count? n // **y <Enter>** n

Enter the new value of the batch size: 10 // **20 <Enter>**

The active hours of operation are indicated below with a "Y"  
M12345678901N12345678901 (M=midnight, N=noon)  
Active hours are: YYYYYYYYYYYYYYYYYYYYYYYY

Do you wish to change these hours? n // **<Enter>** n

```

      F i n a l   P a r a m e t e r   C h e c k l i s t
      -----
DICOM storage provider: LOCAL PACS SIMULATOR
Report scanning order: ASCENDING
Starting with report: 1 (JUN 13, 1990)
Number of studies to export: 20
Active hours of operation: M12345678901N12345678901 (M=midnight, N=noon)
                          YYYYYYYYYYYYYYYYYYYYYYYY

```

Ready to begin exporting DICOM images? **Y <Enter>**

Report #	Accession	Group #	#Images	Date
-----	-----	-----	-----	----
1 :	061390-3			
2 :	061390-6			
3 :	061390-1			
4 :	082492-9			
5 :	082492-13			
6 :	061390-8	81	60 images	JUN 13, 1990\

#### 4.16.5.3 Batch Export of Radiology Images by Selected Patient

This capability is used to export a set of Radiology images for a given Patient. The user identifies the patient and indicates whether the studies should be exported in ascending (chronological) or descending (reverse chronological) order. It is also allow the user to determine when to run the Batch Export process, perhaps only during the off-hours. This capability is most useful for exporting a set of studies to a DICOM CD Burner.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #5 (Batch Export VistA Radiology Images).

This program will enter image files into a transmission queue in the DICOM IMAGE OUTPUT File (#2006.574) (stored in ^MAGDOUTP ( 2006.574 , ...)).

```

*****
***
*** V i s t A   D I C O M   I m a g e   E x p o r t e r
*** -----
***
*** This program may be used to copy radiology images from VistA to a
*** another DICOM image archive.
***
*** The regular "Transmit DICOM Images to a Storage SCP" menu option
*** is used to copy the images to the other DICOM image archive.
*** You may use Ctrl-C (^C) to stop this process, if you need to abort it.
***
*****

```

Scan by Date, Report Number, or Patient (D, N, or P): **PATIENT <Enter>**

All uses pose potential violations of patient privacy.

It is absolutely required that all users with transmission capability personally inspect each downloaded image.

For technical reasons, related to the image capture process, some of the images contain patient identification data which must be removed manually.

Each image transmitted is tracked and audited by the Imaging System.

The images are not to be distributed outside of the VA, or used for any other purposes than listed below.

The transmitting user is specifically responsible for the protection of these images.

Press <Enter> to continue: **<Enter>**

Indicate the reason for transmission:

- [a] Clinical care for the patient whose images are being transmitted
- [b] Clinical care for other VA patients
- [c] Use in approved research by VA staff
- [d] Approved teaching purposes by VA staff
- [e] Use in approved VA publications
- [f] Clinical care (Export to HIPAA Compliant Archive)

## Chapter 4 – Image Gateway

Enter letter for reason: **A** <Enter>  
Enter electronic signature: xxx <Enter>

The DICOM storage provider is "LOCAL PACS SIMULATOR".

Do you wish to change it? n // <Enter> n

The patient is currently defined as follows:

Social Sec#	Patient's Name	Birth Date
-----	-----	-----
000-84-4831	PATIENT, B	1929

Do you wish to change it? n // **Y** <Enter>

Enter Patient: MADT -- 1 MATCHES

Social Sec#	Patient's Name	Birth Date
-----	-----	-----
1) 000-50-5000	PATIENT, F	1924

Patient has 7 radiology reports on file, from DEC 24, 1992 to NOV 01, 1999

Is this the correct patient? No // **Y** <Enter>

The radiology reports will be scanned in the "ASCENDING" order.

Do you wish to change it? n // <Enter> n

Enter the earliest date for the report.

Earliest Report Date: DEC 24, 1992// <Enter> (DEC 24, 1992)

Enter the latest date for the report.

Latest Report Date: NOV 01, 1999@23:59// <Enter> (NOV 01, 1999@23:59)

The active hours of operation are indicated below with a "Y"  
M12345678901N12345678901 (M=midnight, N=noon)

Active hours are: YYYYYYYYYYYYYYYYYYYYYYYY

Do you wish to change these hours? n // <Enter> n

F i n a l P a r a m e t e r C h e c k l i s t

-----

DICOM storage provider: LOCAL PACS SIMULATOR  
Report scanning order: ASCENDING  
Patient Name: PATIENT, F  
Social Security Number: 000-50-5000  
Date of Birth: 1924  
Earliest date for report: DEC 24, 1992  
Latest date for report: NOV 01, 1999@23:59  
Active hours of operation: M12345678901N12345678901 (M=midnight, N=noon)  
YYYYYYYYYYYYYYYYYYYYYYYY

Ready to begin exporting DICOM images? **Y** <Enter>

Report #	Accession	Group #	#Images	Date
-----	-----	-----	-----	----
45 :	122492-31	53	1 image	DEC 24, 1992\

### 4.16.6 Display Batch Export Statistics

The history and progress of batch export transmission can be displayed.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #2 (Image Gateway).
2. In the second menu, select #8 (Send DICOM Images to Another Storage Server).
3. In the third menu, select #6 (Display Batch Export Statistics).

Vista DICOM Export Utility Statistics

Current Status: Export Utility has ABORTED

Active hours of operation: M12345678901N12345678901 (M=midnight, N=noon)  
 YYYYYYYYYYYYYYYYYYYYYYYY

DICOM storage provider: EYE STORAGE SCP

Run	Started	A/D	First	Batch/Studies	Finished	Last	#Images
1	10/07 08:18	D	201	10/2	10/07 08:19	200	4

Run	Started	A/D	Begin Date	Stop Date	Finished	#Images
2	12/14 07:42	D	11/24/98	04/01/05	12/14 08:08	987

DICOM storage provider: RADIOLOGY STORAGE SCP

Run	Started	A/D	Begin Date	Stop Date	Last Date	Finished	#Images
3	02/23 14:33	A	11/24/98	02/23/06	11/24/98	(incomplete)	27

DICOM storage provider: LOCAL PACS SIMULATOR

Run	Started	A/D	Begin Date	Stop Date	Last Date	Finished	#Images
4	02/23 14:35	A	11/24/98	02/23/06	11/24/98	(incomplete)	27

Run	Started	A/D	First	Batch/Studies	Finished	Last	#Images
5	02/23 14:42	A	1	20/	02/23 14:42	5	60

```

*** PATIENT: PATIENT,B                000-84-4831    1929 ***
Run      Started    A/D    Begin Date    Stop Date    Finished    #Images
---      -
  6    02/23 14:52    A      06/13/90    08/24/92    02/23 14:52

```

#### 4.17 Display a DICOM Image Header

Occasionally, for operational reasons, you may have to display the contents of a DICOM image header.

This program displays DICOM encoded image headers in human-readable form (it is the same program as described for the DICOM Text Gateway above in Section 3.11, but with different defaults).

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

- In the first menu, select #2 (Image Gateway).
- In the second menu, select #9 (Display a DICOM Image Header).

The user will be asked to enter the number of the file to display. All unprocessed image files are in the **D:\DICOM\Image\_In** directory. The example below shows the formatted output of the information in the file **D:\DICOM\Image\_In\A0000001.DCM**. As a shortcut, the name of this file can be entered by selecting “**I**” (for image) and file number “**1**” (to indicate the first image).

**Note:** An object that has been stored in VistA in DICOM format can be displayed by entering the grave accent (``) followed by the internal entry number in the Image File (#2005) (stored in ^MAG(2005)).

Ready to read a DICOM file? y// y <Enter>

Enter output device ("S" for screen or "F" for file): S// <Enter> Screen

Enter the queue letter (a-h or s-z), or I for image (or '^' to exit): I// I <Enter>

Enter file number (or path): 1 <Enter>

DUMP of DICOM file D:\DICOM\Image\_In\A0000001.DCM

```

O      G      E      L                      Created at 14:17 PM on 26-MAY-1999
f      r      l      e
f      o      e      n
s      u      m      g
e      p      e      t
t              n      h      A t t r i b u t e      V a l u e

```



```

t
-----
000084:0002,0000 UL 0004 Group Length "204 (0x000000CC)"
000090:0002,0001 OB 0002 File Meta Information Ver "0 (0x00)"
"1 (0x01)"
00009E:0002,0002 UI 001A Media Storage SOP Class U "1.2.840.10008.5.1.4.1.1.1"
Computed Radiography Image Storage
0000C0:0002,0003 UI 0034 Media Storage SOP Instanc "1.3.46.670589.8.922140021400
... 3.96.8.12.11.12.53.26711"
0000FC:0002,0010 UI 0012 Transfer Syntax UID "1.2.840.10008.1.2"
Implicit VR Little Endian
000116:0002,0012 UI 0016 Implementation Class UID "1.2.840.113754.2.1.1.0"
000134:0002,0013 SH 000E Implementation Version Na "VA DICOM V2.5"
00014A:0002,0016 AE 000A Source Application Entity "DICOM_TEST"
00015C:0008,0005 CS 000A Specific Character Set "ISO_IR 100"
00016E:0008,0008 CS 0010 Image Type "DERIVED"
"PRIMARY"
000186:0008,0016 UI 001A SOP Class UID "1.2.840.10008.5.1.4.1.1.1"
Computed Radiography Image Storage
0001A8:0008,0018 UI 0034 SOP Instance UID "1.3.46.670589.8.922140021400
... 3.96.8.12.11.12.53.26711"
0001E4:0008,0020 DA 0008 Study Date "19950928"
0001F4:0008,0021 DA 0008 Series Date "19950928"
000204:0008,0023 DA 0008 Image Date "19950928"
000214:0008,0030 TM 0006 Study Time "110223"
000222:0008,0031 TM 0006 Series Time "110223"
000230:0008,0033 TM 0006 Image Time "110223"
00023E:0008,0050 SH 000C Accession Number "exam number"
000252:0008,0060 CS 0002 Modality "CR"
00025C:0008,0070 LO 0018 Manufacturer "Philips Medical Systems"
00027C:0008,0080 LO 0020 Institution Name "Philips Medical Systems Hamb
... urg"
0002A4:0008,0090 PN 0004 Referring Physician's Nam "ward"
0002B0:0008,1010 SH 000C Station Name "THORAVISION"
0002C4:0008,1030 LO 0006 Study Description "THORAX"
0002D2:0008,1040 LO 000E Institutional Department "Our Department"
0002E8:0008,1090 LO 0024 Manufacturer's Model Name "Cassette Holder Type 9840 50
... 0 70201"
000314:0010,0010 PN 0016 Patient's Name "Pacemaker THORAVISION"
000332:0010,0020 LO 000C Patient ID "IMAGPatient1,One"
000346:0010,0030 DA 0008 Patient's Birth Date "19071230"
000356:0010,0040 CS 0002 Patient's Sex "F"
000360:0010,1000 LO 0006 Other Patient IDs "26279"
00036E:0018,0015 CS 0006 Body Part Examined "CHEST"
00037C:0018,0060 DS 0004 KVP "150"
000388:0018,1000 LO 000A Device Serial Number "92.00.003"
00039A:0018,1020 LO 000E Software Version(s) "Version 3.3.1"
0003B0:0018,1110 DS 0004 Distance Source to Detect "1995"
0003BC:0018,1150 IS 0002 Exposure Time "6"
0003C6:0018,1152 IS 0002 Exposure "1"
0003D0:0018,115E DS 0006 Image Area Dose Product "0.800"
0003DE:0018,1160 SH 000A Filter Type "0.1Cu 1Al"
0003F0:0018,1170 IS 0002 Generator Power "50"
0003FA:0018,1180 SH 000A Collimator/grid Name "Upper,1250"
00040C:0018,1190 DS 0002 Focal Spot(s) "2"
000416:0018,1200 DA 0000 Date of Last Calibration "<unknown>"
00041E:0018,1201 TM 0000 Time of Last Calibration "<unknown>"
000426:0018,1260 SH 0010 Plate Type "Sel Drum 500x500"
00043E:0018,1700 CS 000C Collimator Shape "RECTANGULAR"
000452:0018,1702 IS 0004 Collimator Left Vertical "-171"
00045E:0018,1704 IS 0004 Collimator Right Vertical "171"
00046A:0018,1706 IS 0004 Collimator Upper Horizont "814"
000476:0018,1708 IS 0004 Collimator Lower Horizont "1196"
000482:0018,5020 LO 002E Processing Function "6000,17074,9962,10877,11098,"

```

```

... 14765,18206,20536"
0004B8:0018,5021 LO 000E Postprocessing Function "UKE_pa_020395"
0004CE:0018,5101 CS 0002 View Position "PA"
0004D8:0018,6000 DS 0002 Sensitivity "0"
0004E2:0020,000D UI 0024 Study Instance UID "1.3.46.670589.8.922140021400
... 3.25269"
00050E:0020,000E UI 0026 Series Instance UID "1.3.46.670589.8.922140021400
... 3.25269.1"
00053C:0020,0010 SH 0006 Study ID "25269"
00054A:0020,0011 IS 0002 Series Number "1"
000554:0020,0013 IS 0006 Image Number "50136"
000562:0020,0020 CS 0004 Patient Orientation "L"
"F"
00056E:0020,4000 LT 000E Image Comments "\\pa\Portrait"
000584:0028,0002 US 0002 Samples per Pixel "1 (0x0001)"
00058E:0028,0004 CS 000C Photometric Interpretatio "MONOCHROME1"
0005A2:0028,0010 US 0002 Rows "1910 (0x0776)"
0005AC:0028,0011 US 0002 Columns "1716 (0x06B4)"
0005B6:0028,0030 DS 000C Pixel Spacing "0.185"
"0.185"
0005CA:0028,0100 US 0002 Bits Allocated "16 (0x0010)"
0005D4:0028,0101 US 0002 Bits Stored "15 (0x000F)"
0005DE:0028,0102 US 0002 High Bit "14 (0x000E)"
0005E8:0028,0103 US 0002 Pixel Representation "0 (0x0000)"
0005F2:0028,1050 DS 0006 Window Center "15000"
000600:0028,1051 DS 0006 Window Width "30000"
00060E:7FE0,0010 OW 05F0 Pixel Data "<image>"
"length=6555120 (0x006405F0)"
"offset=1558 (0x0616)"

```

End of File D:\DICOM\Image\_In\A0000001.DCM (printed 10:53 AM 17-JUN-99)

Enter file number (or path): **<Enter>**

Enter the queue letter (a-h or s-z), or I for image (or '^' to exit): I// ^ **<Enter>**

Push **<Enter>** to continue...

When more than a screenful of information is to be displayed, the program will pause with the prompt “more...”. If the user wishes to terminate the display, this question can be answered with “^”, “No”, “Quit” or “Exit” (this response is not case sensitive).

The following elements (highlighted in the above example) contain data that the VistA Imaging DICOM Gateway uses to properly identify and process the image:

- The Patient Name (0010,0010)
- The Patient ID (0010,0020)
- The Accession Number (0008,0050)
- The Manufacturer (0008,0070)
- The Modality (0008,0060)
- The Manufacturer’s Model Name (0008,1090)
- Further image processing information (number of bits stored, numbers of rows and columns, offset value, etc.)

Some modalities store the Accession Number in a DICOM element other than the standard one (0008,0050). For these instruments, it is usually necessary to train the technologists to manually enter the Accession Number into this element. The VistA Imaging DICOM Gateway then uses information regarding manufacturer, model, and modality to invoke specialized MUMPS code to extract the Accession Number from the surrogate element.

## 4.18 Re-Transmit Images from PACS

Images can be retrieved from a PACS. Normally, the system will automatically retrieve images from a PACS when an operator signals a “study complete” event. In the case that old images need to be re-transmitted from a PACS, the system can be set-up to re-query the PACS for all images from a given date-range. The following menu options are available to support this process:

- 1 Start Querying the PACS
- 2 Stop Querying the PACS
- 3 Maintain Set-Up Parameters

### 4.18.1 Start Querying the PACS

In order to correctly query the PACS, a number of parameters need to be set up. See section 4.18.3 for the complete set of parameters. Many sites prefer to adjust two parameters for each query-session, so an opportunity is offered to change these two parameters when starting a new query session. When no parameters need to be changed, both questions can be answered by just pressing the “Enter” key.

```
Current conversion window is from report #39 to #47.

Scanning order is ASCENDING // <Enter> ASCENDING
Issue queries:
  1. for all studies
  2. only for studies that don't currently have images
  3. only for studies that already have images
Make selection: 1 // <Enter> 1
                  M12345678901N12345678901 (M=midnight, N=noon)
Active hours are: YYYYYYYYYYYYYYYYYYYYYYYY
                  // YYYYYYYYYYYYYYYYYYYYYYYY <Enter>
```

The first question indicates the sequence in which the database is traversed. For some queries it is better to go in chronological order, for some it is better to query in reverse-chronological order. Answer as appropriate.

The second question indicates when queries are to be issued. Depending on the nature of the query, one may want a query to be issued for all studies, or only for those studies that already have images, or just for those studies that don’t have any images in the VistA system yet. Answer this question as appropriate for the query at hand.

The third question relates to the times of day when the query process is allowed to be active. For each hour where a “Y” is selected, the query process will be allowed to be active, for each hour where an “N” is selected the query process will be de-activated. Once the process is started, it

will check the time-of-day regularly, and the process will activate and de-activate itself as desired.

### 4.18.2 Stop Querying the PACS

Use this menu option to signal to the querying process that it should stop.

When this menu option is used, the querying process will complete its current transaction and then exit gracefully. When “Control-C” is pressed in the window where the querying process is running, the process will stop immediately, possibly in the middle of a transaction. Pressing “Control-C” can have undesired side-effects, and hence should be discouraged.

### 4.18.3 Maintain Set-Up Parameters

This menu option can be used to set up all parameters for a PACS query session:

Current conversion window is from report #39 to #47.

Scanning order is ASCENDING // **<Enter>** ASCENDING

Issue queries:

1. for all studies
2. only for studies that don't currently have images
3. only for studies that already have images

Make selection: 1 // 1 **<Enter>**

M12345678901N12345678901 (M=midnight, N=noon)

Active hours are: YYYYYYYYYYYYYYYYYYYYYYYY

// YYYYYYYYYYYYYYYYYYYYYYYY **<Enter>**

Include dashes in SSN? Yes // **<Enter>** Yes

Enter the start-date for the ACR-NEMA era.

1 January 1900// **<Enter>** 1 January 1900

Enter the end-date for the ACR-NEMA era.

25 April 1973// **<Enter>** 25 April 1973

Enter the start-date for the Pre-12.1 era.

26 April 1973// **<Enter>** 26 April 1973

Enter the end-date for the Pre-12.1 era.

31 October 1985// **<Enter>** 31 October 1985

Enter the start-date for the Post-12.1 era.

1 November 1985// **<Enter>** 1 November 1985

Enter the end-date for the Post-12.1 era.

10 February 2003// **<Enter>** 10 February 2003

Enter the start-date for the Fuji era.

1 January 1900// **<Enter>** 1 January 1900

Enter the end-date for the Fuji era.

1 January 2200// **<Enter>** 1 January 2200

Press **<Enter>** to continue...

Note that different PACSs may have different requirements about dashes in SSNs. Be sure to use the setting that is appropriate for the PACS to be queried.

The first two questions are the same as with the menu option from section 4.18.1.

The other six questions have to do with the software that may have been installed on the PACS at different periods of time. When a DICOM Gateway issues a query to the PACS, the information

in the query-request must be formatted such that it corresponds to the information that was stored by the PACS. The software on the PACSs may have been one of three possible generations:

- Software from the ACR/NEMA era (at most sites, that era either never happened or ended around 1998)
- Software from the “pre level 12.1” era (as far as the Development Group knows, no VistA site ever ran that software in production, but the possibility is included as an option nevertheless)
- Software from the “post level 12.1” era (this is most likely the format for all data on most current PACS models).
- Software for the Fuji Synapse PACS models

The dates that are entered indicate the start and end of the various eras. It does not hurt to be “generous” with these limit-dates, and it is permissible to have overlapping date ranges. In order to prevent the DICOM Gateway from issuing any request formatted according to one era, the limit-dates for that era could be set to 1-January-1900 through 1-January-1901 (since there were no computers in those days, the software wouldn’t find any data-records for such an era). Enter dates as appropriate for the site and query.

**(end of Section)**

# Chapter 5 Routing

In VistA Imaging, *routing* is the combination of methods and software used to identify and transmit exams produced at one site to a storage location at another site. Routing takes two forms: autorouting, and on-demand routing.

In *autorouting*, automatically selected images are transmitted to one or more destinations. Images are selected based on a predefined set of routing rules. Autorouting functions are managed using the Routing Gateway.

In *on-demand routing*, manually selected exams are transmitted to one or more destinations. Exams are selected using the VistARad diagnostic workstation and are transmitted by the Routing Gateway.

A properly implemented routing system can streamline a site's Imaging workflow. Scenarios where routing can be used include:

- Workload sharing between institutions or service providers
- Rapid access of exams at remote clinics or other facilities
- Remote specialist interpretation or consultation
- Off-hours, holiday, or emergency services
- Off-site contract radiology services for primary interpretation

## 5.1 Routing Menu-options

The menu-options for the Routing software are:

1. Start the Transmission Processor
2. Stop the Transmission Processor
3. Start the Evaluation Processor
4. Stop the Evaluation Processor
5. Import Routing Rules
6. Purge all Completed Entries in the Transmission Queue
7. Purge Completed and Expired Entries in the Transmission Queue
8. Re-Queue all Failed Entries in the Transmission Queue
9. Remove Obsolete Entries from Transmission Queue
10. Display Routing Rules

The functionality of these menu options is further explained in the VistA Imaging Routing User Guide.

**(end of Section)**



# Chapter 6 System Maintenance

Various utility programs are available to help in the maintenance of the software on the VistA Imaging DICOM Gateway PCs. This chapter describes the various utility programs and tools.

## 6.1 System Maintenance Menu-options

The menu-options for the System Maintenance software are:

1. System Operation
  1. Display MUMPS-to-MUMPS Broker Status
  2. Display DICOM Message Log
  3. Issue a DICOM Echo Request
  4. Display the Version of the Software
  5. Display Gateway Application Usage Statistics
  6. Support Telephone Numbers
  7. Shut Down this System
2. Gateway Configuration and DICOM Master Files
  1. Display Gateway Configuration Parameters
  2. Update Gateway Configuration Parameters
  3. Update INSTRUMENT.DIC
  4. Update MODALITY.DIC
  5. Update PORTLIST.DIC
  6. Update SCU\_LIST.DIC
  7. Update WORKLIST.DIC
  8. Reinitialize All the DICOM Master Files
  9. Create Shortcuts for Instruments
  10. Validate Access/Verify Codes for Modality Worklist
3. MUMPS Utilities
  1. Access MUMPS Error Log
  2. Global Variable Lister
  3. Display MUMPS System Status
  4. Check Available Space in MUMPS Database
  5. Check Available Disk Space
  6. Display License Expiration Date
4. Enter Programmer Mode

## 6.2 System Operation Tools

### 6.2.1 Display MUMPS-to-MUMPS Broker Status

The PCs that run the VistA Imaging DICOM Gateway are connected to the main VistA Hospital Information System using a VA-proprietary protocol for calling “remote procedures”, commonly known as “VA Kernel Broker”.

One characteristic of networking in general is that connections occasionally get broken and need to be remade. All current-day protocols are resilient enough to recover automatically from these

temporary lapses in connectivity. However, sometimes the lapses in connectivity may last long enough that the end-user may notice a disruption in communication.

The VA Kernel Broker also depends on the validity of the end-user's credentials that determine which menu options are accessible to that specific user.

This menu option may be used to determine that...

- The VistA Hospital Information System can still be reached using the configured parameters
- The current end-user's credentials are still valid on the VistA system

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #1 (Display MUMPS-to-MUMPS Broker Status).

When this menu option is executed, any issues with the connectivity will be reported. A normal, successful, status will be displayed as:

```
Configured to connect using M-to-M Broker to address  
"10.11.12.13", port 4300
```

## 6.2.2 Display DICOM Message Log

The operation of the VistA Imaging DICOM Gateway is performed by a number of separate tasks, some which run in the foreground while others run in the background. Many of these tasks produce log files that can be reviewed to observe their progress and to check for any error conditions that may have occurred.

This tool includes a “real-time” message display. This tool can also select which activity is displayed.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #2 (Display DICOM Message Log).

You will receive a “Historical Log or New Activity? N//” prompt.

### 6.2.2.1 New Activity

If you select the option to monitor new activity, you will be asked if you want to display all new activity or the activity for just a specific session. The following example illustrates this:

```
Show new activity in All logs or just the One log? A// O
Display which log? (enter matching string or <null> for all) 127.0.0.1
Receiving "Echo DICOM_ECHO 127.0.0.1"
*****
*** Provider Process (Job #292) Started on AUG 06, 2002 at 08:01:13 ***
*****
*** Connection with 127.0.0.1 on AUG 06, 2002 at 08:01:13 ***
*****

Recving PDU Type: 01H (A-ASSOCIATE-RQ) PDU len=206
d:\DICOM\DATA1\LOGDCM.292\INCOMING.PDU

*****
*** Receiving A-ASSOCIATE-REQUEST on AUG 06, 2002 at 08:01:13 ***
*****
PDU Type: 01H (A-ASSOCIATE-RQ) Length=206
Version=1 Called AE: "DICOM_STORAGE" Calling AE: "DICOM_ECHO"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 20H (Presentation Context Item) Length=46
Presentation Context ID: 1 Result=0
-- Transfer Syntax(es) --
SUBITEM Type: 30H (Abstract Syntax Sub-Item) Length=17
Presentation Context: 1.2.840.10008.1.1 (Verification SOP Class)
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=59
SUBITEM Type: 51H (Maximum Length Sub-Item) Length=4
Maximum PDU length: 16384
ITEM Type: 52H (Implementation Class UID Sub-Item) Length=30
Implementation Class: 1.2.840.113654.2.3.1995.2.10.0 (** Unknown UID: <<1.2.84
0.113654.2.3.1995.2.10.0>> **)
ITEM Type: 55H (Implementation Version Name) Length=13
Implementation Version Name: MIRCTN03AUG98
*****
*** Calling: DICOM_ECHO Called: DICOM_STORAGE ***
*****

*****
*** Sending A-ASSOCIATE-ACCEPT to DICOM_ECHO ***
*****

PDU Type: 02H (A-ASSOCIATE-AC) Length=177
Version=1 Called AE: "DICOM_STORAGE" Calling AE: "DICOM_ECHO"
ITEM Type: 10H (Application Context Item) Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)
ITEM Type: 21H (Presentation Context Item) Length=25
Presentation Context ID: 1 Result=0 (acceptance)
-- Transfer Syntax(es) --
SUBITEM Type: 40H (Transfer Syntax Sub-Item) Length=17
Transfer Syntax: 1.2.840.10008.1.2 (Implicit VR Little Endian)
-- End of Transfer Syntax(es) --
ITEM Type: 50H (User Information Item) Length=51
```

```

SUBITEM Type: 51H (Maximum Length Sub-Item)                Length=4
Maximum PDU length: 32768
ITEM Type: 52H (Implementation Class UID Sub-Item)          Length=22
Implementation Class: 1.2.840.113754.2.1.3.0 (VA DICOM V3.0)
ITEM Type: 55H (Implementation Version Name)                Length=13
Implementation Version Name: VA DICOM V3.0

Sending PDU Type: 02H (A-ASSOCIATE-AC) Length: 177
d:\DICOM\DATA1\LOGDCM.292\OUTGOING.PDU
Recving PDU Type: 04H (P-DATA-TF) PDU len=74 PDV hdr=3, pc=1, len=68
d:\DICOM\DATA1\LOGDCM.292\INCOMING.DCM
Reading d:\DICOM\DATA1\LOGDCM.292\INCOMING.DCM
*****
*** Echo Request Received ***
*****
FILE d:\DICOM\DATA1\LOGDCM.292\OUTGOING.DCM -- VERIFICATION ECHO RESPONSE -- NO
MESSAGE HANDLE YET

Sending PDU Type: 04H (P-DATA-TF) Length: 90 (90)
d:\DICOM\DATA1\LOGDCM.292\OUTGOING.DCM PDU len=96 PDV hdr=3, pc=1, len=90

Recving PDU Type: 05H (A-RELEASE-RQ) PDU len=4
d:\DICOM\DATA1\LOGDCM.292\INCOMING.PDU

Sending PDU Type: 06H (A-RELEASE-RP) Length: 4
d:\DICOM\DATA1\LOGDCM.292\OUTGOING.PDU

```

The real-time display of the log is terminated by entering Control-C (^C) on the keyboard.

### 6.2.2.2 Historical Log

The historical log files may be viewed as follows:

Log #	Process Start & End	Description
1	25-FEB 11:22 11:22	PACS Gateway
2	25-FEB 11:22 11:22	User Requested DICOM Echo
3	25-FEB 11:22 11:22	User with LOCAL MODALITY WORKLIST
4	25-FEB 11:22 11:22	Echo Vista Testing 127.0.0.1,localhost

Enter Log Number: 4// <Enter> 4

Print the log to a File or display it on the Screen? S// <Enter> S

```

*****
*** Provider Process (Job #19) Started on FEB 25, 2000 at 11:22:10 ***
*****
*** Connection with 127.0.0.1,localhost on FEB 25, 2000 at 11:22:10 ***
*****

```

```

Recving PDU Type: 01H (A-ASSOCIATE-RQ) PDU len=253
D:\DICOM\Data1\LOGDCE.019\INCOMING.PDU

```

```

*****
*** Receiving A-ASSOCIATE-REQUEST on FEB 25, 2000 at 11:22:11 ***
*****

```

```

PDU Type: 01H (A-ASSOCIATE-RQ)                Length=253
Version=1          Called AE: "Vista_Worklist"  Calling AE: "Vista Testing"
ITEM Type: 10H (Application Context Item)        Length=21
Application Context: 1.2.840.10008.3.1.1.1 (DICOM Application Context Name)

```

Press <Enter> to continue, ^ to exit...

The TCP/IP connection is shown above, followed by the beginning of the association session. The details of the log require a working knowledge of the DICOM Standard (PS 3.7-1999), as well as familiarization with the VistA Imaging DICOM Gateway implementation. It is more useful for support personnel.

### 6.2.3 Issue a DICOM Echo Request

This menu option may be used to check whether DICOM communication is possible with a known Application Entity (instrument, PACS, etc.) that is registered in the master file **F:\DICOM\Dict\SCU\_List.DIC**.

Prerequisite:

- Target DICOM Validation Service Class Provider (configured to respond to VistA)

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #3 (Issue a DICOM Echo Request).

The following example shows the results of a successful DIOCM Echo test:

```
Generate a DICOM ECHO request
Service Class Providers
-----
1 -- LOCAL MODALITY WORKLIST
2 -- LOCAL IMAGE STORAGE

Select the provider application (1-2): 1// 1
Sending the PDU to the SCP
|
DICOM ECHO Completed Successfully
```

When either the TCP/IP address or the port number is incorrect, the following response and error message might be obtained:

```
Generate a DICOM ECHO request
Service Class Providers
-----
1 -- LOCAL MODALITY WORKLIST
2 -- LOCAL IMAGE STORAGE

Select the provider application (1-2): 1// 2
```

```
*****
*** TCP not setup correctly ***
*** Connecting to IP Address "ERRORHOST", port "60100". ***
*** Cannot open Socket ***
*** Routine: ^MAGDTCPL Please Call Support Personnel ***
*****
```

When the target Application Entity is not set up to respond to DICOM Echo requests, the following response and error message may be encountered:

```
Generate a DICOM ECHO request
Service Class Providers
-----
1 -- LOCAL MODALITY WORKLIST
2 -- LOCAL IMAGE STORAGE

Select the provider application (1-2): 2// 2
Sending the PDU to the SCP
|
*****
*** DICOM GATEWAY ERROR ***
*** Unknown Presentation Context ID for 1.2.840.10008.1.1 ***
*** Routine: ^MAGDTCPL Please Call Support Personnel ***
*****
```

## 6.2.4 Display the Version of the Software

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #4 (Display the Version of the Software).

This menu-option may be used to identify the version and build numbers of the current Vista Imaging DICOM Gateway software.

This is "IMAGING 3.0" created on 12-February-2004.

```
Installed patches:
Patch 9: 31-March-2003
Patch 10: 20-November-2003
Patch 11: 12-February-2004
Patch 21: 30-October-2003
```

Press <Enter> to continue...

### 6.2.5 Display Gateway Application Usage Statistics

This menu-option starts a program that displays the numbers of invocations of menu options at the site. It is useful for troubleshooting problems.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #5 (Display Gateway Application Usage Statistics).

Display Gateway Configuration Parameters

```
25 Feb 2000:    1 invocation
Total:         1
```

Install INSTRUMENT.DIC

```
29 Feb 2000:    3 invocations
Total:         3
```

Support Telephone Numbers

```
25 Feb 2000:    1 invocation
Total:         1
```

Display Imaging Usage Statistics

```
25 Feb 2000:    2 invocations
Total:         2
```

Issue DICOM Echo Request

```
25 Feb 2000:    4 invocations
Total:         4
```

Start Processing Text Messages from HIS

```
25 Feb 2000:    3 invocations
Total:         3
```

Display DICOM Message Log

```
25 Feb 2000:    6 invocations
29 Feb 2000:    5 invocations
Total:        11
```

Press <Enter> to continue:

### 6.2.6 Support Telephone Numbers

When a user encounters problems with the VistA Imaging DICOM Gateway Software, the National VistA Support Help Desk can be called for assistance. This option may be used to list the telephone numbers. Please tell the Help Desk personnel that this is a problem with a VistA Imaging DICOM Gateway.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #6 (Support Telephone Numbers).

The following information will be output:

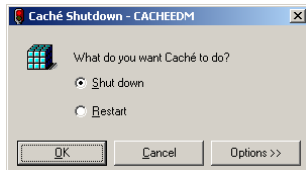
```
National VISTA Support Help Desk  
(888) 596-HELP
```

```
DVA Washington CIO Field Office -- Imaging Project  
(301) 734-0100 voice (301) 734-0111 fax
```

Push <Enter> to continue...

### 6.2.7 Shut Down this System

The normal method for shutting down a Caché system is to right-click on the (blue) Caché Cube and then select the option **Stop Caché**. After this, a confirmation window will pop up...



...and the **Shut down** option can be selected.

It is also possible to shut down the Caché system using this menu option.

Either way, the Caché System should always be shut down *before* a PC is to be powered off. **The Caché Database Management software should never be terminated without allowing the Caché software to shut down gracefully.** Failure to run the Caché System Shut Down procedure may cause the internal database to become corrupted, or may prevent the most recent transactions from being stored permanently.

**Note:** This option may only be invoked from a “Caché Console window”.



Prerequisites:

- Caché must be up and running

Open a Caché Console Window to start a session for this menu option.

After login (type **D ^MAGDLOGN <Enter>**), select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #1 (System Operation).
3. In the third menu, select #7 (Shut this System Down).

```

Cache Shutdown Status:  9:26 am 30 Dec 2005

0 interactive jobs (Telnet/Lat)
1 background job (from job command)
0 Cache Direct server jobs
0 Cache Objects server jobs
0 CSP server jobs
0 ODBC server jobs
14 system jobs

Do you want to broadcast a message to anyone? No => <Enter> No
Do you want to see the Cache status report? No => <Enter> No
Do you want to run the user defined shutdown routine? Yes => <Enter> Yes
Are you ready for the system to halt? Yes => <Enter> Yes

09:26:52 Shutting down Cache
09:26:52 Notifying Clients
09:26:52 Executing user-defined shutdown routines
09:26:52 Stopping User Jobs
09:26:52 Stopping Network Servers
09:26:52 Withdrawing from License Domain
09:26:52 Waiting for users to stop
09:26:52 Stopping Client Networking
09:26:52 Removing database locks
09:26:52 Updating Journal File
09:26:52 Waiting for database updates to complete
09:26:52 Database updates complete
09:26:52 Stopping System Jobs
09:26:54 Shutdown complete

<Session disconnected>

```

### 6.3 Gateway Configuration and DICOM Master Files

This set of menu options reference the various parameters that control the VistA Imaging DICOM Gateway.

The format and content of the master files is described in a separate document (VistA Imaging DICOM Gateway Installation Guide).

**Note:** It is strongly recommended that rather than support separate copies of the dictionary files on each gateway system, the site should maintain a single copy of the DICOM dictionary files in

the **F:\DICOM\Dict** directory on a network drive, from which it can be accessed by all the systems.

**Warning:** Using any of the menu options in this section while VistA Imaging DICOM Gateway software is active may have unpredictable results. Before making any changes to the configuration parameters or master files, always stop all active DICOM processes by waiting until they reach an idle state, and then terminating them.

### 6.3.1 Display Gateway Configuration Parameters

This menu option can be used to obtain a quick overview of the parameters that define the processor-specific settings for the current computer. These parameters (stored locally in the DICOM Gateway Parameter File (#2006.563) ^MAGDICOM(2006.563)) may be changed and updated using the **Update Gateway Configuration Parameters** menu option. (see Section 6.3.2).

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #1 (Display Gateway Configuration Parameters).

The Gateway Configuration Parameters file will display. A sample file is shown below; values will vary from site to site.

#### Gateway Configuration Parameters

```
-----
ASCII DICOM TEXT = YES
COMMERCIAL PACS = N/A
CONFIG DATE/TIME = 3030620.09084
CONSOLIDATED = NO
CSTORE CONTROL PORT = 60000
CURRENT IMAGE DESTINATION = <varies>
CURRENT IMAGE FILE NAME = <varies>
CURRENT IMAGE POINTER = <varies>
CURRENT IMAGE SOURCE = <varies>
DAILY REPORT = <varies>
DATA PATH / 1 = d:\DICOM\DATA1
DATA PATH / 2 = d:\DICOM\DATA2
DICT PATH = d:\DICOM\DICT
DOMAIN = TESTSITE.MED.VA.GOV
EMED_C_MOVE_DELAY = N/A
FREE DISK SPACE = 2
```

```

IMAGE GATEWAY = YES
IMAGE INPUT PATH = d:\DICOM\IMAGE_IN
INSTALL / 1 = <varies>
INSTALL / N = <varies>
INSTRUMENT PATH = d:\DICOM\INSTRUMENT
LAST IMAGE POINTER = <varies>
LAST RAD REPORT POINTER = <varies>
LOCATION = 660 - SALT LAKE CITY
LOGIN ACCESS = *****
LOGIN PRINT/VIEW ONLY = *****
LOGIN PROGRAMMER ACCESS = *****
LOGIN SUPPORT = *****
LOGIN VERIFY = *****
M-to-M BROKER ADDR = 111.222.33.44
M-to-M BROKER MSGS = NO
M-to-M BROKER BGND ACCESS = *****
M-to-M BROKER BGND VERIFY = *****
M-to-M BROKER PORT = 4800
MACHINE ID = M
MAILGROUP = john.doe@med.va.gov
MESSAGE LOG = YES
MODALITY WORKLIST = YES
MULTIFRAME COUNTER = 0
PACS EXAM COMPLETE = NO
POST OFFICE = xxx.xxx.xxx.xxx
ROUTING PROCESSOR = NO
ROUTING RULES = NO
SEND CPT MODIFIERS = YES
SEND PACS TEXT = YES
SHOW PATIENT NAME & ID = YES
SSN DASHES FOR PACS = NO
SYSTEM TITLE = Silver Spring Test Gateway
TEXT GATEWAY = YES
TEXT GATEWAY SERVICE = RAD,CON
UID ROOT = 1.2.840.113754
VERSION = VA DICOM V3.0
WORKLIST PORT = 60010

```

Push <Enter> to continue...

### 6.3.2 Update Gateway Configuration Parameters

There are some parameters that will be different for every Imaging DICOM Gateway PC. System-specific parameters deal with names of workstations, names of disks where certain groups of data are stored, whether or not certain transactions are to be processed, and so forth.

Please refer to the VistA Imaging DICOM Gateway Installation Guide for a description of these configuration parameters.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #2 (Update Gateway Configuration Parameters).

### 6.3.2.1 System Title

Please enter the system title: *system title*  
xxxxxxxxxx <Enter>

- The system title is a short character string that appears on the top of the main DICOM application menu.
- The system title may not contain caret (^) or vertical bar (|).

Examples:

“DICOM Image Server System #3”

“DICOM Text Gateway and Background Processor”

### 6.3.2.2 Location (Institution)

This computer is currently located at *location name (location number)*  
Are you sure you wish to change it? NO//

Each VistA Imaging DICOM Gateway “belongs” to a location. A location is defined in the Institution File (#4). When a site does not run the “consolidated” version of the Imaging Software, the locations of all VistA Imaging DICOM Gateways at that site are the same as the location of the site that is defined in the Imaging Site Parameters File (#2006.1).

When a site does run the “consolidated” version of the Imaging Software, each VistA Imaging DICOM Gateway may have its “own” location, however, a VistA Imaging DICOM Gateway can only have a location that is defined as an entry in the Imaging Site Parameters.

**Note:** If a VistA Imaging DICOM Gateway is configured to use the MUMPS-to-MUMPS Broker, a user will only be able to login on that VistA Imaging DICOM Gateway if, in the main VistA system, that user is granted access to the “Division” that corresponds to the location of the VistA Imaging DICOM Gateway.

### 6.3.2.3 Drive Letter for Text Gateway Data

Please enter the device letter for  
the DICOM text directory: `x://`

The DICOM text directory is usually on the local system, and is used to hold the DICOM text files. `C:\DICOM` (or `D:\DICOM`) is typically the DICOM text directory. You may select another device letter (C:-Z:), however.

### 6.3.2.4 Drive Letter for Image Gateway Data

Please enter the device letter for  
the DICOM image directories: `x://`

The DICOM image directories are usually on the local system and are used to hold both the input and output image files. `C:\DICOM` (or `D:\DICOM`) is typically the DICOM image directory. You may select another device letter (C:-Z:), however.

### 6.3.2.5 Free Disk Space Threshold

Please enter the percentage of free disk space  
required to allow storage of image files: `free space%//`

Storage of image files should not be allowed when there is not enough free disk space left to allow for proper processing of these files. A typical percentage of free space to require is 15%.

### 6.3.2.6 Drive Letter for Master File Data

Enter the device letter for  
the DICOM dictionary directory: `x://`

The DICOM dictionary directory is usually on a networked system, and is used to hold both the DICOM text and image files. `C:\DICOM` (or `D:\DICOM`) is typically the DICOM data directory.

**Note:** You may select another device letter (C:-Z:), however.

### 6.3.2.7 Number of Channels

Please enter the number of communication channels *number//*

Communication channels are used to broadcast VistA event data. A separate channel is needed for each different destination. For instance, event data may be sent to both a commercial PACS and to one or more Modality Worklist service class providers. Each destination must have its own event channel number and a dedicated subdirectory on the Text Gateway drive (`x:\DICOM\Datan\...`).

The number of communication channels must be between 1 and 9.

#### **6.3.2.8 Machine ID**

Please enter the machine ID: *ID//*

Each DICOM machine needs a single unique identification letter. Use “A” for the first, “B” for the second, “C” for the third, et cetera.

The names of the DICOM image files acquired by this system will begin with this letter.

#### **6.3.2.9 Image Gateway**

Will this computer be a DICOM Image Gateway? *Yes or No//*

- Answering “Yes” to this question will have the effect that settings will be enabled that allow this system to be used as an image gateway.
- Answering “No” means that it will not be possible to use this system as an image gateway.
- A system can be configured to be a text gateway as well as an image gateway, as well as a Routing Gateway.

#### **6.3.2.10 Text Gateway**

Will this computer be a DICOM Text Gateway? *Yes or No//*

- Answering “Yes” this question will have the effect that settings will be enabled that allow this system to be used as a text gateway.
- Answering “No” means that it will not be possible to use this system as a text gateway.
- A system can be configured to be a text gateway as well as an image gateway, as well as a Routing Gateway.

#### **6.3.2.11 Routing gateway**

Will this computer be a Routing Processor? *Yes or No//*

- Answering “Yes” to this question will have the effect that settings will be enabled that allow this system to be used as a Routing Processor.
- Answering “No” means that it will not be possible to use this system as a Routing Processor.
- Only answer “Yes” when “auto-routing” is active.
- A system can be configured to be a text gateway as well as an image gateway, as well as a Routing Gateway.

#### **6.3.2.12 Auto Routing**

Will this computer be part of a system

where 'autorouting' is active? *Yes or No//*

- Answering “Yes” to this question will have the effect that queue entries will be generated for the evaluation of routing rules when images are acquired.
- Answering “No” means that no such entries will be generated.
- Only answer “Yes” when “auto-routing” is active.

**Note:** if a site has experimented with Routing and has completed the experiment, or when a site decides to not perform Routing activities for a while, it is important that this switch be set to “No”. Failure to do so will cause a significant accumulation of entries in the Rule Evaluation Queue, while there will be no process that takes any of these entries out of this queue.

### 6.3.2.13 Radiology and/or Consults

Will this Text Gateway be used for RADIOLOGY? *Yes or No//*

Will this Text Gateway be used for CONSULTS? *Yes or No//*

- It is possible to configure two Text Gateways, one for RADIOLOGY and the other for CONSULTS.
- If the Gateway being configured is to be the only Text Gateway and it is going to be used for both RADIOLOGY and CONSULTS (the default configuration), answer “Yes” to both questions.
- Otherwise, answer “Yes” or “No” as appropriate for the computer at hand.

### 6.3.2.14 Text messages to Commercial PACS

Send text to a commercial PACS, Mitra Broker, et cetera? *Yes or No//*

This question will only be asked on a system that is slated to be used as a Text Gateway.

- Answering “Yes” to this question will have the effect that settings will be enabled to use this system to send text messages to external systems.
- Answering “No” means that it will not be possible to send such messages.

### 6.3.2.15 Exam Complete Messages

Is a PACS going to send Exam Complete messages to VistA? *Yes or No//*

- Answering “Yes” to this question will have the effect that settings will be enabled that allow this system to receive Exam Complete messages from a PACS to trigger image transfer.
- Answering “No” means that this system will not be prepared to receive such messages.

### 6.3.2.16 Commercial PACS

Select the kind of commercial PACS at this site

-----

1. GE Medical Systems PACS with Mitra PACS Broker
2. GE Medical Systems PACS with ACR-NEMA Text Gateway
3. EMED;eMed Technology Corporation PACS
4. Other commercial PACS

What kind of a PACS? *type//*

This question will only be asked on a system that is slated to either be sending text messages to a PACS, or to be receiving Exam Complete messages from a PACS.

Select the kind of commercial PACS that is installed at the site. If the PACS is from GE Medical Systems, make sure to specify whether it uses the (new) Mitra Broker, or the (old) ACR-NEMA protocol version of the Text Gateway.

### 6.3.2.17 AE Title for C-MOVE

Enter the PACS-to-VistA C-Move destination AE Title: *VISTA\_STORAGE//*

Normally, the AE Title of the VistA system for this purpose is “VISTA\_STORAGE”. When a PACS is sending images to multiple systems, the PACS needs to be able to distinguish between the various systems, and each system will need to use a unique name.

Enter the name that is appropriate for your site.

### 6.3.2.18 Modality Worklist

Will this system be a Modality Worklist Provider? *Yes or No//*

This question will only be asked on a system that is slated to be used as a Text Gateway.

- Answering “Yes” to this question will have the effect that settings will be enabled that allow this system to operate as a Modality Worklist Provider.
- Answering “No” means that this system will not be able to respond to Modality Worklist requests.

### 6.3.2.19 CPT Modifiers

Send CPT Modifiers? *Yes or No//*

- Answering “Yes” to this question will have the effect that when CPT codes are transmitted, modifiers will be included.
- Answering “No” means that such modifiers will be omitted.



**6.3.2.20 Delay after Exam Complete**

Delay for C-Move request after Exam Complete [min]: *time//*

This question will only be asked on a system that is slated to either be sending text messages to a PACS, or to be receiving Exam Complete messages from a PACS.

Enter a time-delay value (like 5m 30s for 5 minutes, 30 seconds) for the period that should elapse between the moment an “Exam Complete” message arrives, and the moment a C-MOVE request can be initiated.

**6.3.2.21 Dashes in Social Security Numbers**

Include DASHES in Social Security Numbers sent to PACS? *Yes or No//*

This question will only be asked on a system that is slated to send text messages to a PACS.

- Answering “Yes” to this question will have the effect that when Social Security Numbers are transmitted to PACS, dashes will be included. (This is the default: nnn-nn-nnnn.)
- Answering “No” means that this pair of dashes will be omitted.

**6.3.2.22 VistA System IP Address**

Enter the network address for the main VistA HIS: *address//*

This question will only be asked on a system that is slated to use the MUMPS-to-MUMPS Broker.

Please enter the network address for the main VistA Hospital Information System where the MUMPS-to-MUMPS Broker Listener is running. Enter it either in “*nnn.nnn.nnn.nnn*” format, or as an entry in the HOSTS file.

**6.3.2.23 MUMPS-to-MUMPS Broker Listener Port Number**

Enter the network port number for the main VistA HIS: *number//*

This question will only be asked on a system that is slated to use the MUMPS-to-MUMPS Broker.

- Please enter the port number of the MUMPS-to-MUMPS Broker Listener on the main VistA Hospital Information System.
- A TCP/IP port number is an integer between 0 and 65,535 (typically higher than 2048).
- Please note that the MUMPS-to-MUMPS Broker Listener must be running on the main VistA Hospital Information System in addition to the regular RPC Broker. Be sure to enter

the port number of the MUMPS-to-MUMPS Broker Listener and not that of the traditional RPC Broker.

#### **6.3.2.24 Email Address for Emergency Messages**

Send emergency e-mail notices to: *address//*

The answer to this question must be the name of a mailgroup.

- Note that names of mailgroups may contain letters and digits and dashes, but no spaces.
- The name of the mailgroup and the name of the server where this group resides are separated by one at-sign (@).  
(These messages are sent by SMTP-mail, not by FORUM-mail!)
- A valid name of a mailgroup would be:  
G.MAGDBB@LAVC.ISC-WASH.VA.GOV

#### **6.3.2.25 Display Names of Patients**

Display Patient Name/ID in Image Processing? *Yes or No//*

- Answering “Yes” to this question will enable the normal image processing application to display the patient name and id ssn.
- Answering “No” will disable the display of the patient identification. This may be necessary to comply with HIPAA.

#### **6.3.2.26 Access Code for Modality Worklist**

When an external entity sends a Modality Worklist request to a DICOM Gateway, the DICOM Gateway is usually able to respond to the request using information that is stored on the Gateway itself. In some cases, the DICOM Gateway will need to query the VistA system for details to report back to the requester. When the DICOM Gateway makes such a request to the VistA system, it will use the access code that is specified as the answer to this question.

**Note:** the response to this question is treated as a password, i.e. it is not displayed on the monitor of the end-user.

Access Code for Modality Worklist *//*

#### **6.3.2.27 Verify Code for Modality Worklist**

When an external entity sends a Modality Worklist request to a DICOM Gateway, the DICOM Gateway is usually able to respond to the request using information that is stored on the Gateway

itself. In some cases, the DICOM Gateway will need to query the VistA system for details to report back to the requester. When the DICOM Gateway makes such a request to the VistA system, it will use the access code that is specified as the answer to this question.

**Note:** The response to this question is treated as a password, i.e. it is not displayed on the monitor of the end-user.

```
Verify Code for Modality Worklist //
```

### 6.3.2.28 Modality Worklist Port Numbers

Normally, modality worklist requests are processed through TCP/IP port number 60010. Some sites have equipment that uses a different port number, and that cannot be configured to use any other port number. In order to support such equipment, it is possible to define additional port numbers for modality worklist processors.

```
Currently, there is a Modality WorkList processor for
the following port:
    60010
```

```
Change? [A/D/N] N// ? <Enter>
```

```
Enter one of the following:
```

```
    No                if no (additional) change is to be made
```

```
    Add <number>      to add a listener for a port
```

```
    Delete <number>    to remove a listener for a port
```

```
Note that valid port numbers are integers between 1 and 65535.
```

```
Note that the listener for port 60010 may not be removed.
```

```
Currently, there is a Modality WorkList processor for
the following port:
    60010
```

```
Change? [A/D/N] N// a 104 <Enter>
```

```
Currently, there are Modality WorkList processors for
the following ports:
```

```
    104
```

```
    60010
```

```
Change? [A/D/N] N// d 104 <Enter>
```

```
Currently, there is a Modality WorkList processor for
the following port:
```

```
    60010
```

```
Change? [A/D/N] N//
```

### 6.3.2.29 Email Post Office

The Department of Veterans Affairs has three virus-checking post offices set up for nationwide email. The post office that should be selected for this setting should be the one to which the site has the best network connection. Possible responses are listed below:

**0:** use the local VistA system (default)

- 1: use the Virus-Checking Office in Silver Spring, MD at 10.2.27.92
- 2: use the Virus-Checking Office in Hines, IL at 10.3.27.92
- 3: use the Virus-Checking Office in San Francisco, CA at 10.6.27.92
- 4: use VA-Forum at 10.2.29.131

...or enter the TCP/IP address of the system to be used.

Which post-office will this computer use? // **smtp.va.gov** <Enter>

**Note:** VA policy on the use of email post offices has changed several times while this documentation was being prepared. At the time this document was published, the only value allowed for this setting was “**smtp.va.gov**”. Consult with your ISO to obtain information about current policy in this matter.

### 6.3.3 Update INSTRUMENT.DIC

The list of individual instruments that are being used at a site is maintained in master file **F:\DICOM\Dict\Instrument.DIC**. This menu option loads the contents of this file into the VistA Imaging DICOM Gateway MUMPS database.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #3 (Update INSTRUMENT.DIC).

The following will be displayed to confirm the progress of the dictionary update:

```
Building the Instrument Dictionary -- ^MAGDICOM(2006.581)
Ready to read dictionary file "F:\DICOM\Dict\INSTRUMENT.DIC"?  y// y <Enter>

Comment: <<List of Image Acquisition Instruments>>
Comment: <<>>
Comment: <<Mnemonic|Description|Institution ID|Imaging Service|Port|MachineID>>
Comment: <<  Institution ID can be the number (688), name (Washington, DC), or null.>>
Comment: <<  Leave Institution ID to null to default to the local site>>
Comment: <<  Note: the Machine ID is optional>>
Comment: <<>>
Comment: << Imaging services are defined as follows>>
Comment: <<    RAD ----- Radology>>
Comment: <<    CON ----- Consult/Procedure Request Tracking (CPRS)>>
Comment: <<>>
Comment: <<>>
Comment: << Examples:>>
```

```

Comment: <<>>
Comment: << Computed Radiography>>
CR1 -- Fuji AC3 CR, Room 2156 -- 460 -- RAD -- 60100
CR2 -- Fuji AC3 CR, Room 2160 (Chest) -- 460 -- RAD -- 60101
CR3 -- Fuji AC3 CR, Cubby, 2145 Hallway -- 460 -- RAD -- 60102
Comment: <<>>
Comment: << Computed Tomography>>
CT1 -- GE High Speed Advantage, Room 2142 -- 460 -- RAD -- 60120
Comment: <<>>
Comment: << Digital Radio Fluoro>>
DRS1 -- GE Digital Radio Fluoro, Rm 2163 -- 460 -- RAD -- 60140
DRS2 -- GE Digital Radio Fluoro, Rm 2150 -- 460 -- RAD -- 60141
Comment: <<>>
Comment: << Special Procedures>>
LCA -- GE LCA Advantex DLX, Rm 2143 -- 460 -- RAD -- 60150
Comment: <<>>
LUMISYS -- Lumisys Scanner, Rm 2122 -- 460 -- RAD -- 60190
Comment: <<>>
Comment: << Ultrasound>>
US -- ATL Ultramark9, Rm 2136 -- 460 -- RAD -- 60160
Comment: <<>>
Comment: << Nuclear Medicine>>
NM -- Siemens, Rm 2093 -- 460 -- RAD -- 60170
Comment: <<>>
Comment: << GE Windows Workstation>>
GI-FLUORO -- ASPECT -- 512 -- CON -- 60210
Comment: <<>>
ADW -- GE Advantage Workstation -- 460 -- RAD -- 60200
Comment: <<>>
Comment: << Default DICOM Port>>
DEFAULT -- Default DICOM Port -- 512 -- RAD -- 104
Comment: <<>>
Comment: <<>>
Comment: << Place your entries below>>

```

**Note:** In the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading.

### 6.3.4 Update MODALITY.DIC

Image processing is controlled by fields in the **F:\DICOM\Dict\Modality.DIC** master file. This menu option loads the contents of this file into the VistA Imaging DICOM Gateway MUMPS database.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #4 (Update MODALITY.DIC).

The following will be displayed to confirm the progress of the dictionary update:

```
Building the Modality Type Dictionary -- ^MAGDICOM(2006.582)
Ready to read dictionary file "F:\DICOM\Dict\MODALITY.DIC"? y// y <Enter>

Comment: << List of different types of modality image acquisition instruments>>
Comment: <<>>
Comment: << mfg# | model | modality | mag_dcmtotga.exe parameters | case# lookup code
Comment: << | data extraction code|data extraction file|imaging service>>
Comment: <<>>
Comment: << Note: for Healthcare Providers, use the following two values: >>
Comment: << demtotga.exe parameters should be "<DICOM>">>
Comment: << Case# lookup code should be "CORRECT^MAGDIR3">>
Comment: <<>>
Comment: << Imaging services are defined as follows>>
Comment: << RAD ----- Radology>>
Comment: << CON ----- Consult/Procedure Request Tracking (CPRS)>>
Comment: <<
Comment: << Examples:>>
Comment: <<>>
ACMECTCOMPANY -- BETA -- CT -- b12 f0
                GECT^MAGDIR3 -- GECT^MAGDIR4A -- datagect.dic
GEMEDICALSYSTEMS -- GENESIS_JUPITER -- CT -- b12 f0
                GECT^MAGDIR3 -- GECT^MAGDIR4A -- datagect.dic
GEMEDICALSYSTEMS -- GENESIS_HISPEED_RP -- CT -- b12 f0
                GECTHISA^MAGDIR3 -- GECT^MAGDIR4A -- datagect.dic
GEMEDICALSYSTEMS -- HISPEEDRP -- CT -- b12 f0
                GECTHISA^MAGDIR3 -- GECT^MAGDIR4A -- datagect.dic
GEMEDICALSYSTEMS -- GENESIS_SIGNA -- MR -- b12 f0
                LONGCASE^MAGDIR3 -- GECT^MAGDIR4A -- datagect.dic
GEMEDICALSYSTEMS -- DRS -- RF -- b8
                GEDRS^MAGDIR3 -- GELCA^MAGDIR4A -- datamisc.dic
GEMEDICALSYSTEMS -- DLX -- XA -- b10
                STUDYID^MAGDIR3 -- GELCA^MAGDIR4A -- datamisc.dic
PICKERINTERNATIONAL,INC. -- PQ2000 -- CT -- b12 a1000 f0 c4095
                PQ2000^MAGDIR3 -- PICKERCT^MAGDIR4A -- datagect.dic
PICKERINTERNATIONAL,INC. -- PQ2000 -- SC -- b12 a1000 f0 c4095
                PQ2000^MAGDIR3 -- PICKERCT^MAGDIR4A -- datagect.dic
DEJARNETTERRESEARCHSYSTEMS -- IMAGESHAREFUJICRACQUISITIONSTATION -- CR -- b10 f0
c1023 R8/b10 f0 c1023
                LONGCASE^MAGDIR3 -- -- datamisc.dic
LUMISYS -- * -- CR -- b12 f0 c4095 R8
                LONGCASE^MAGDIR3 -- -- datamisc.dic
LUMISYS -- * -- SC -- b12 f0 c4095 R8
                LONGCASE^MAGDIR3 -- -- datamisc.dic
LUMISYS -- * -- RAD -- b12 f0 c4095 R8
                LONGCASE^MAGDIR3 -- -- datamisc.dic
ASPECTELECTRONICS,INC. -- ACCESSACQUISITIONMODULE -- US -- b8
                PIDCASE^MAGDIR3 -- -- datamisc.dic
TOPCON -- NW6S -- XC -- <DICOM>
                CORRECT^MAGDIR3 -- datamisc.dic -- CON
#
Comment: <<>>
Comment: << Place your entries below>>
Comment: << end of file>>

Ready to build the "Data Transfer" Dictionaries? y// y <Enter>
F:\DICOM\Dict\DataGECT.DIC
F:\DICOM\Dict\DataMISC.DIC
```

**Note:** In the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading.

### 6.3.5 Update PORTLIST.DIC

**Note:** This dictionary is only needed if your site is interfacing to a commercial PACS or a commercial Modality Worklist Broker (i.e., a Mitra Broker or a DeJarnette MediShare).

The list of VistA Server TCP/IP port numbers is maintained in master file

**F:\DICOM\Dict\PortList.DIC.** This menu option loads the contents of this file into the VistA Imaging DICOM Gateway MUMPS database.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #5 (Update PORTLIST.DIC).

The following will be displayed to confirm the progress of the dictionary update:

```
Building the TCP/IP Provider Port Dictionary -- ^MAGDICOM(2006.584)
Ready to read dictionary file "F:\DICOM\Dict\PORTLIST.DIC"? y// y <Enter>

Comment: <<Menu Option|AE Title|Port|File Mode (FIFO QUEUE or DIRECT)|CHANNEL>>
PACS INTERFACE -- VISTA PACS I/F -- 60040 -- FIFO QUEUE -- 1
Comment: <<MITRA Broker Interface|Vista PACS I/F|60041|FIFO QUEUE|2>>
Comment: <<DeJarnette Medishare Interface|Vista PACS I/F|60042|FIFO QUEUE|2>>
Comment: <<Perry Point CR (a)|PP_CR_A|60043|DIRECT|1>>
Comment: <<Perry Point CR (b)|PP_CR_B|60044|DIRECT|1>>
```

**Note:** In the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading.

### 6.3.6 Update SCU\_LIST.DIC

**Note:** This site-specific dictionary is rather complicated and should be only edited with the assistance of VistA Imaging Support Personnel.

The list of descriptions of User Applications that are being used at a site is maintained in master file **F:\DICOM\Dict\SCU\_List.DIC.** This menu option loads the contents of this file into the VistA Imaging DICOM Gateway MUMPS database.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #6 (Update SCU\_LIST.DIC).

The following will be displayed to confirm the progress of the dictionary update:

```
Building the User Application Dictionary -- ^MAGDICOM(2006.585)
Ready to read dictionary file "F:\DICOM\Dict\SCU_LIST.DIC"? y// y <Enter>

Comment: << User Application List>>
Comment: << Format:>>
Comment: << line 1:Application Name|Called AE Title|Calling AE Title|Destination
        IP Address|Socket>>
Comment: << line 2:|Presentation Context Name|Transfer Syntax Name>>
Comment: << line 3:|Transfer Syntax Name (if there are more than one)>>
Comment: <<>>
Comment: << Examples:>>
Comment: <<>>
Comment: << EMED Query/Retrieve|EMED_SCP_LAND|VISTA_QR_SCU|111.222.333.172|104>>
Comment: << |Verification SOP Class|Implicit VR Little Endian>>
Comment: << |Study Root Query/Retrieve Information Model - MOVE|Implicit VR Little Endian>>
Comment: <<>>
Comment: << GEMS PACS Query/Retrieve|QueryRetrieve|VISTA_QR_SCU|111.222.333.73|104>>
Comment: << |Verification SOP Class|Implicit VR Little Endian>>
Comment: << |Study Root Query/Retrieve Information Model - FIND|Implicit VR Little Endian>>
Comment: << |Study Root Query/Retrieve Information Model - MOVE|Implicit VR Little Endian>>
Comment: <<>>
Comment: << MITRA Modality Worklist|Testing|SCANNER1|TEST_NT1|60010>>
Comment: << |Verification SOP Class|Implicit VR Little Endian>>
Comment: << |Modality Worklist Information Model - FIND|Implicit VR Little Endian>>
Comment: <<>>
Comment: << DeJarnette Lasershare|Lasershare|Vista Send Image|127.0.0.1|60100>>
Comment: << |CT Image Storage|Implicit VR Little Endian>>
Comment: <<>>
Comment: <<>>
LOCAL MODALITY WORKLIST^Vista_Worklist^Vista Testing^LOCALHOST^60010
    Verification SOP Class
        Implicit VR Little Endian
    Modality Worklist Information Model - FIND
        Implicit VR Little Endian
Comment: <<>>
LOCAL IMAGE STORAGE^Vista_Storage^Vista Testing^LOCALHOST^60100
    CT Image Storage
        Implicit VR Little Endian
Comment: <<>>
Comment: << Place your entries below>>
```



Comment: << end of file>>

**Note:** In the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading.

### 6.3.7 Update WORKLIST.DIC

**Note:** This dictionary must contain an entry for every device that is going to use the DICOM Modality Worklist service.

The list of descriptions of instruments that use DICOM Modality Worklist at each site is maintained in master file **F:\DICOM\Dict\WorkList.DIC**. This menu option loads the contents of this file into the VistA Imaging DICOM Gateway MUMPS database.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #7 (Update WORKLIST.DIC).

The following will be displayed to confirm the progress of the dictionary update:

```
Building the Modality Worklist Dictionary -- ^MAGDICOM(2006.583)
Ready to read dictionary file "F:\DICOM\Dict\WORKLIST.DIC"? y// y <Enter>
```

```
Comment: << List of Modality Worklist service users>>
Comment: <<>>
Comment: << Station AE Title|Institution ID|Imaging Service|Imaging Type>>
Comment:<< |Short or Long Accession Number|Description>>
Comment: << Instituion ID can be the number (688), name (Washington, DC), or null.>>
Comment: << Leave Institution ID to null to default to the local site >>
Comment: << Imaging Types are from IMAGE INDEX FOR SPECIALTY / SUBSPECIALTY>>
Comment: <<>>
Comment: << Imaging services are defined as follows>>
Comment: << RAD ----- Radology>>
Comment: << CON ----- Consult/Procedure Request Tracking (CPRS)>>
Comment: <<>>
Comment: <<>>
Comment: << Examples:>>
Comment: <<>>
Comment: << IM_CR|BALTIMORE, MD|RAD|RAD|SHORT>>
Comment: << MS_FCRIDGW|BALTIMORE, MD|RAD|RAD|SHORT>>
Comment: << SCANNER1|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << LUMISYS|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << ALI_SCU|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << PICKER_KRUSTY|BALTIMORE, MD|RAD|RAD|LONG>>
```

```

Comment: << PCU_QWL_SCU|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << PICKER_NM_MW|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << ALIPC_QWL_SCU|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: << IMCR_1|BALTIMORE, MD|RAD|RAD|LONG>>
Comment: <<>>
Comment: << Healthcre Providers>>
Comment: << IRIS-1||CON|OPHTH|LONG|Canon Retinal Camera, Eye Clinic, Rm, E-170>>
Comment: << DENIX-2||CON|DENTAL|LONG|Intra-Oral Xray Unit, Rm, D-153>>
Comment: << GI_LAB_SCU|<Your Institution goes here>|CON|GI|LONG|North Clinic>>
Comment: << IRIS-1||CON|OPHTH|LONG|Canon Retinal Camera, Eye Clinic, Rm, E-170>>
Comment: << DENIX-2||CON|DENTAL|LONG|Intra-Oral Xray Unit, Rm, D-153>>
Comment: << GI_LAB_SCU|<Your Institution goes here>|CON|GI|LONG|North Clinic>>
Comment: <<>>
Comment: << Test AE title is for exercising the local VISTA MWL provider>>
TEST -- 523 -- RAD -- RAD -- LOG
Comment: <<>>
Comment: << Place your entries below>>

```

**Note:** In the .dic files, leading and trailing spaces are ignored when the data is imported into the database. This makes it possible to align information for easier reading.

### 6.3.8 Reinitialize All the DICOM Master Files

In addition to the site-specific master files, there are a number of master files that contain static information that is needed by the VistA Imaging DICOM Gateways. Examples of such files are the list of DICOM “elements”, the list of supported SOP classes, the list of recognized HL7 messages, and so forth.

When this menu option is started, the contents of all master files, the “static” ones as well as the site-specific ones, will be re-loaded into the VistA Imaging DICOM Gateway. This menu option should be run whenever you need to apply an update to the static master file dictionaries.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #8 (Reinitialize All the DICOM Master Files).

```
Ready to build all of the DICOM Master Files? y// <Enter> yes
```

```
This system's title is "Timbuktu DICOM Gateway"
```

```
Do you wish to change it? n// <Enter> no -- not changed
```

```
Please enter the device letter for the DICOM text directory: d:// <Enter> d
```

```
Please enter the device letter for the DICOM image directories: d:// <Enter> d
```

```

Enter the device letter for the DICOM dictionary directory: d:// <Enter> d

Please enter the number of communication channels  2// <Enter> 2

Please enter the machine id:  A// <Enter> A

Output ASCII *.TXT files for all DICOM messages?  YES// <Enter> YES

Will this system be a DICOM Image Gateway?  YES// <Enter> YES

Will this system be a DICOM Text Gateway?  YES// <Enter> YES

Will this computer be a Routing Processor? NO// <Enter> NO

Will this computer be part of a system
where 'autorouting' is active? NO// <Enter> NO

Will this Text Gateway be used for RADIOLOGY? YES// <Enter> YES

Will this Text Gateway be used for CONSULTS? YES// <Enter> YES

Send text to a commercial PACS, Mitra Broker, etc.?  YES// <Enter> YES

Is a PACS going to send Exam Complete messages to VistA?  NO// <Enter> NO

Will this system be a Modality Worklist Provider?  YES// <Enter> YES

Keep a detailed log of every message?  YES// <Enter> YES

Send CPT Modifiers? NO// <Enter> NO

Include DASHES in Social Security Numbers sent to PACS? NO// <Enter> NO

Use M-to-M Broker? NO// <Enter> NO

Send emergency e-mail notices to: john.doe@va.gov// <Enter> john.doe@va.gov

Display Patient Name/ID in Image Processing? YES// <Enter> YES


Building the DICOM Element Dictionary -- ^MAGDICOM(2006.51)
Ready to read dictionary file "F:\DICOM\Dict\ELEMENT.DIC"?  y// <Enter> y


Building the DICOM Message Template Dictionary -- ^MAGDICOM(2006.52)
Ready to read dictionary file "F:\DICOM\Dict\TEMPLATE.DIC"?  y// <Enter> y


*** PASS 1 STARTED ***
*** PASS 2 STARTED ***
- DONE -


Building the DICOM UID Dictionary -- ^MAGDICOM(2006.53)
Ready to read dictionary file "F:\DICOM\Dict\UID.DIC"?  y// <Enter> y


Updating the extended SOP negotiation table... done!

Updating the PDU TYPE table... done!

Updating the Imaging Service table...

```

done!

```
Building the ^DICOM(HL7) dictionary
Ready to read dictionary file "F:\DICOM\Dict\HL7.dic"?  y// <Enter> y
```

done!

```
Building the Instrument Dictionary -- ^MAGDICOM(2006.581)
Ready to read dictionary file "F:\DICOM\Dict\INSTRUMENT.DIC"?  y// <Enter> y
```

```
Building the Modality Type Dictionary -- ^MAGDICOM(2006.582)
Ready to read dictionary file "F:\DICOM\Dict\MODALITY.DIC"?  y// <Enter> y
```

```
Building the Modality Worklist Dictionary -- ^MAGDICOM(2006.583)
Ready to read dictionary file "F:\DICOM\Dict\WORKLIST.DIC"?  y// <Enter> y
```

```
Building the TCP/IP Provider Port Dictionary -- ^MAGDICOM(2006.584)
Ready to read dictionary file "F:\DICOM\Dict\PORTLIST.DIC"?  y// <Enter> y
```

```
Building the User Application Dictionary -- ^MAGDICOM(2006.585)
Ready to read dictionary file "F:\DICOM\Dict\SCU_LIST.DIC"?  y// <Enter> y
```

```
Building the Provider Application Dictionary -- ^MAGDICOM(2006.586)
Ready to read dictionary file "F:\DICOM\Dict\SCP_LIST.DIC"?  y// <Enter> y
```

```
Ready to build the "Data Transfer" Dictionaries?  y// <Enter> y
```

```
-- DICOM Master File Build completed successfully --
```

### 6.3.9 Create Shortcuts for Instruments

Whenever the INSTRUMENT.DIC is modified, the user has the option of also automatically creating the shortcuts for them in the Instrument folder on the desktop. This will create shortcuts with the mnemonic names that are used to internally identify the instruments. Alternatively, the user can manually copy an existing shortcut to create new ones, and then edit them.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #10 (Create Shortcuts for Instruments).

The creation of the instrument shortcuts is performed silently, and there is no output. After it is completed, the user is given the opportunity to edit the file named `hosts` that maps symbolic names onto physical IP addresses, usually stored in the directory:

```
c:\winnt\system32\drivers\etc
```

See the VistA Imaging Installation Guide for more details.

### 6.3.10 Validate Access/Verify Codes for Modality Worklist

When an external entity sends a Modality Worklist request to a DICOM Gateway, the DICOM Gateway is usually able to respond to the request using information that is stored on the Gateway itself. In some cases, the DICOM Gateway will need to query the VistA system for details to report back to the requester. When the DICOM Gateway makes such a request to the VistA system, it will use the access and verify codes that were set up using menu option 4-2-2, Update Gateway Configuration Parameters. Since credentials may be changed on the VistA system, there is a need to check temporarily whether the stored credentials are still valid. This menu option is provided to perform such checks.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #2 (Gateway Configuration and DICOM Master Files).
3. In the third menu, select #1 (Validate Access/Verify Codes for Modality Worklist).

When this menu option is executed, it will report either:

Access and Verify codes are valid for background task usage.

or

Access and Verify codes are NOT valid for background task usage.

### 6.3.11 Site-Specific Parameters

In addition to the parameters that are different for each gateway processor, there are also parameters that are site-specific. These parameters are in the Imaging Site Parameters File (#2006.1) (stored in `^MAG(2006.1,...)`). The site-specific parameters that apply to the VistA Imaging DICOM Gateways are described below. Please refer to the VistA Imaging Installation Guide for additional information.

#### **6.3.11.1 Purge Retention Days PACS File**

This field is used by the Background Processor purge to determine the number of days to retain DICOM image files. All DICOM images that have not been accessed in this many days will be removed from magnetic storage by automatic file migration procedures.

A typical value for this parameter is **120** days (roughly 4 months).

#### **6.3.11.2 Percentage Free Space DICOM Messages**

The value of this field is the minimum percentage of free space for a DICOM Text Gateway.

A typical value for this parameter is **25** percent.

The menu option “Start Processing Text Messages from HIS” automatically checks the value of this site parameter at every iteration, before it attempts to store any additional data is stored. If the amount of free space is less than this threshold, a purge will be executed automatically (There will be a momentary delay in processing while the purge runs).

#### **6.3.11.3 Retention Days DICOM Messages**

The value of this parameter is the number of days that old processed DICOM messages are to be retained. The subroutine that purges old DICOM messages will only remove messages that are older than this number of days.

A typical value for this parameter is **25** days.

#### **6.3.11.4 Purge Retention Days PACS Big File**

This field is used by the Background Processor purge function to determine the number of days to retain “Big” DICOM files. All “Big” DICOM images that have not been accessed in this many days will be removed from magnetic storage by the Background Processor purge function.

A typical value for this parameter is **90** days (roughly 3 months).

#### **6.3.11.5 PACS Interface Switch**

The value of this field is set to **1** if there is a VistA DICOM Image Gateway. Otherwise, this value is either empty or **0**.

When this switch is turned “off”, the site parameters PURGE-RETENTION DAYS PACS FILE, PCT FREE SPACE DICOM MSGS and PURGE-RETEN DAYS PACS BIG FILE will be ignored by the VistA Imaging DICOM Gateway software.

#### **6.3.11.6 PACS Image Write Location**

The value of this parameter is a pointer to the Network Location File (#2005.2) (stored in ^MAGD( 2005.2 , ... )). This value indicates the drive to which images are currently being written. DICOM images are copied to the network location specified by this field.

## 6.4 MUMPS Utilities

### 6.4.1 Access MUMPS Error Log

In order to help diagnose problems with the VistA Imaging DICOM Gateway software, it is necessary to determine if there was a MUMPS error in the application.

When a MUMPS error occurs in the VistA Imaging DICOM Gateway software, an entry is made in an error log file. Information about the nature of the error, the date and time when the error occurred and the internal status of the application when the error occurred is recorded.

This error log may be accessed and maintained using this menu option. (This utility can also be invoked by typing **D ^%ER** at the command line in programmer mode.) Please report all significant errors to the National Help Desk.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #3 (MUMPS Utilities).
3. In the third menu, select #1 (Access MUMPS Error Log).

The output typically will look like the following:

```
For Date: T <Enter> 30 Dec 2005    1 Error
```

```
Error: 1 <Enter>
```

```
1. <SUBSCRIPT>SHIELD+19^MAGDMFB at 8:23 am. $I=|TRM|:|2540 ($X=0 $Y=242)
   $J=2540 $ZA=2 $ZB= $ZS=16384 ($S=16634272)
       E S D1=0 F S D1=$O(^MAGDMLOG(D0,1,D1)) Q:'D0 W
$G(^MAGDMLOG(D0,1,D1,0)),!
```

```
Variable: D0 <Enter> (copying data ... done)
(base stack level = 3)
      D0      =      16
```

```
Variable: <Enter>
```

```
Error: <Enter>
```

```
For Date: <Enter>
```

### 6.4.2 Global Variable Lister

This menu-option may be used to view the values of entries in databases through the general-purpose “Global Variable Lister” program. (This utility can also be invoked by typing **D ^%G** at the command line in programmer mode.)

This utility program is mainly intended to support diagnostic activities.

#### DO NOT CHANGE ENTRIES IN ANY GLOBAL FILE.

**The Food and Drug Administration classifies the VistA Imaging DICOM Gateway as a medical device. As such, it may not be changed in any way. Modifications to the software or database may result in an adulterated medical device under 21CFR820, the use of which is considered to be a violation of US Federal Statutes.**

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #3 (MUMPS Utilities).
3. In the third menu, select #2 (Global Variable Lister).

The output typically will look like the following:

```
Device: <Enter>      Right margin: 80=> <Enter>

Global ^MAGDICOM(2006.563 <Enter>
^MAGDICOM(2006.563,0)=DICOM GATEWAY PARAMETER^2006.563^1^1
^MAGDICOM(2006.563,1,"ASCII DICOM TEXT")=YES
      "COMMERCIAL PACS")=N/A
      "CONFIG DATE/TIME")=3051229.092311
      "CONSOLIDATED")=NO
      "CSTORE CONTROL PORT")=60000
      "CURRENT IMAGE DESTINATION")=c:\mag1h\DM00\00\00\00\88\
^MAGDICOM(2006.563,1,"DATA PATH",0)=^2006.5631^2^2
^MAGDICOM(2006.563,1,"DATA PATH",1,0)=C:\DICOM\DATA1
^MAGDICOM(2006.563,1,"DATA PATH",2,0)=C:\DICOM\DATA2
^MAGDICOM(2006.563,1,"DICT PATH")=C:\DICOM\DICT
      "DOMAIN")=IMGDEM01.MED.VA.GOV
      "EMED_C_MOVE_DELAY")=0
      "FREE DISK SPACE")=15
      "IMAGE GATEWAY")=YES
      "IMAGE INPUT PATH")=C:\DICOM\IMAGE_IN
      "IMAGE OUTPUT PATH")=C:\DICOM\IMAGE_OUT
      "INSTRUMENT PATH")=C:\DICOM\INSTRUMENT
      "LOCATION")=660
      "LOCATION NAME")=SALT LAKE CITY
      "LOGIN PROGRAMMER ACCESS")=5007061268
```



```

      "M-to-M BROKER ADDR")=127.0.0.1
      "M-to-M BROKER BGND ACCESS")=*****
      "M-to-M BROKER BGND VERIFY")=*****
      "M-to-M BROKER PORT")=4300
      "M2M DEBUG")=0
      "MACHINE ID")=C
      "MAG VISTA CHECKSUMS")=1
      "MAILGROUP")=ed.demoel@med.va.gov
      "MESSAGE LOG")=YES
      "MODALITY WORKLIST")=YES
      "PACS EXAM COMPLETE")=NO
      "POST OFFICE")=10.2.27.92
^MAGDICOM(2006.563,1,"PROFILE",1,0)=135^*****
^MAGDICOM(2006.563,1,"ROUTING PROCESSOR")=YES
      "ROUTING RULES")=YES
      "SEND CPT MODIFIERS")=NO
      "SEND PACS TEXT")=NO
      "SHOW PATIENT NAME & ID")=NO
      "SSN DASHES FOR PACS")=NO
      "SYSTEM TITLE")=Ed's Cache Test Gateway
      "TEXT GATEWAY")=YES
      "TEXT GATEWAY SERVICE")=RAD,CON
      "UID ROOT")=1.2.840.113754
      "VERSION")=VA DICOM V3.0
      "WORKLIST PORT")=60010
^MAGDICOM(2006.563,1,"WORKLIST PORT",0)=^2006.5632^1^1
^MAGDICOM(2006.563,1,"WORKLIST PORT",1,1,0)=60010

Global ^ <Enter>

```

### 6.4.3 Display MUMPS System Status

This menu option displays the status of all active MUMPS processes (user tasks as well as system tasks).

Normally, a system status can be obtained by right-clicking on the Caché Cube and then selecting the menu option **Control Panel**. In the Control Panel, select the option labeled **Processes**. When accessing a Caché system remotely, a system status can also be invoked from the DICOM Gateway menu.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #3 (MUMPS Utilities).
3. In the third menu, select #3 (Display MUMPS System Status).

This menu option displays the status of all active MUMPS processes (user tasks as well as system tasks). (This utility can also be invoked by typing `D ^%SS` at the command line in programmer mode.)

The output typically will look like the following:

```

Cache System Status: 10:00 am 03 Jan 2006

Process  Devices      KB Namespace      Routine      CPU,Glob  Pri  UIC  Location
1480      %SYS              0,0          7  0,0  CONTROL
1760      %SYS            41,310        8  0,0  WRTDMN
1776      %SYS              0,0          7  0,0  GARCOL
1784      %SYS            511,8         7  0,0  JRNDMN
1792      %SYS              0,0          7  0,0  EXPDMN
 356  //./nul         64 %SYS      TASKMGR    4438,853    7  0,0
2032  //./nul         43 %SYS      CLNDMN      33,10      7  0,0
2044  //./nul         60 ^c:\cachesys\mgr\
      MONITOR    1041,33      7  0,0
      c:\cachesys\mgr\cconsole.log
 164  //./nul         49 %SYS      LMFMON    4564,23      7  0,0  LMFMON
 216  |TCP|60000      57 DICOM    MAGDCST2   1505,228      7  0,0
2484  |TCP|60000      57 DICOM    MAGDCST2   1517,227      7  0,0
2596  |TCP|60000      57 DICOM    MAGDCST2   1526,232      7  0,0
2300* |TRM|:|2300    101 DICOM    MAGDBB    4742155,256187  7  0,0
      |TCP|4300
 212  |TCP|1972       45 %SYS      %cmtP       52,14        7  0,0
 340  |TCP|60000      48 DICOM      ZSTU        70,12        7  0,0
      c:\dicom\cache\cstore.out
3008  |TCP|1972       68 %SYS      %CDSrv0     6228,266      7  0,0
3228* -           120 DICOM    MAGDDR2A   1154656,50656  7  0,0
      t:\dicom\data1\w00000\w0000001.xxx
      t:\dicom\data1\w00000\w0000001.dcm
      |TCP|4300
      |TRM|:|3228
2452* -           84 DICOM    MAGDCST4   148046,1563    7  0,0
      |TNT|localhost:1086|2452
      |TCP|4300
3308* |TRM|:|3308     68 DICOM      %SS        1920,30        7  0,0
3444  |TCP|60010      48 DICOM      ZSTU         49,12        7  0,0
      c:\dicom\cache\worklist_60010.out
3092* |TCP|60040      96 DICOM    MAGDTCP3   161015,1997    7  0,0
      |TNT|localhost:1104|3092

12 user, 10 system, 16 mb global/8 mb routine cache

```

The information displayed by this option is as follows:

Column Heading	Description
Process	The job number of the task.
Devices	The devices that are being used by the process, typically an internal number that identifies a terminal, and the TCP/IP address and port-number when the terminal in question represents a telnet session.
KB	The current amount of memory being used.
Namespace	The name of the environment in which the jobs are being processed (%SYS indicates a system-related task, DICOM indicates an application-related task).

Column Heading	Description
Routine	The name of the program that is currently running.
CPU	The amount of MUMPS instructions that have been executed by the process.
Glob	The number of accesses to global variables that have been executed by the process.
PRI	The current priority of the process.
UIC	The User Identification Code of the process (for a DICOM Gateway, this will always be 0,0).
Location	The current status of the process.

Normally, the following tasks can be expected to be present:

There are always some processes that are active in the namespace called %SYS. These processes are part of the Caché system and should not be manipulated by end-users.

```

1480          %SYS          0,0      7  0,0  CONTROL
1760          %SYS          41,310   8  0,0  WRTDMN
1776          %SYS          0,0      7  0,0  GARCOL
1784          %SYS          511,8     7  0,0  JRNDMN
1792          %SYS          0,0      7  0,0  EXPDMN
 356  //./nul    64 %SYS          TASKMGR  4438,853  7  0,0
2032  //./nul    43 %SYS          CLNDMN    33,10    7  0,0
2044  //./nul    60 ^c:\cachesys\mgr\
                        MONITOR    1041,33    7  0,0
                        c:\cachesys\mgr\cconsole.log
 164  //./nul    49 %SYS          LMFMON    4564,23    7  0,0  LMFMON
 212  |TCP|1972   45 %SYS          %cmtP     52,14    7  0,0
3008  |TCP|1972   68 %SYS          %CDSrv0    6228,266  7  0,0

```

Then, of course, there is the process that runs the system status program:

```

3308*  |TRM|:|3308  68 DICOM          %SS          1920,30    7  0,0

```

The next sets of processes are the TCP/IP socket listener tasks, which should always be present. These tasks listen on specific network ports and start new programs when connections are made to them. The VistA Imaging DICOM Gateway uses two of these tasks, one listening on 60000 for the Storage service, and the other listening on 60010 for the Modality Worklist service.

```

 340  |TCP|60000   48 DICOM          ZSTU          70,12    7  0,0
                        c:\dicom\cache\cstore.out
3444  |TCP|60010   48 DICOM          ZSTU          49,12    7  0,0
                        c:\dicom\cache\worklist_60010.out

```

Then there are the background MUMPS DICOM Storage Controller tasks for the foreground MAG\_C-Store server processes. On a VistA DICOM Image Gateway, one or more MAG\_C-Store process should always be active, each with its own MUMPS DICOM Storage Controller. (These processes should not be present on a VistA DICOM Text Gateway.)

```

 216  |TCP|60000   57 DICOM          MAGDCST2    1505,228  7  0,0
2484  |TCP|60000   57 DICOM          MAGDCST2    1517,227  7  0,0

```

```
2596 |TCP|60000 57 DICOM MAGDCST2 1526,232 7 0,0
```

An Image Gateway usually also has the task that displays the VistA DICOM Image Gateway statistics. It will typically be waiting for input from the terminal:

```
2452* - 84 DICOM MAGDCST4 148046,1563 7 0,0
      |TNT|localhost:1086|2452
      |TCP|4300
```

Next is the task that processes DICOM images. It should always be active on an image gateway. When it is idling, the routine name will show as “MAGDBB”, when it is processing images, the routine is usually one of the MAGDIR\* ones.

```
2300* |TRM|:|2300 101 DICOM MAGDBB 4742155,256187 7 0,0
      |TCP|4300
```

Then there is the task that processes text messages. This process should always be active on a VistA DICOM Text Gateway. When it is idling, the routine will show as “MAGDBB”, when it is processing messages, any other routine may be reported.

```
3228* - 120 DICOM MAGDDR2A 1154656,50656 7 0,0
      t:\dicom\data1\w00000\w0000001.xxx
      t:\dicom\data1\w00000\w0000001.dcm
      |TCP|4300
      |TRM|:|3228
```

Finally, there is the task that sends DICOM text messages to a commercial PACS. This task should be active on a VistA DICOM Text Gateway, if it is configured to support this activity. When it is idling, the routine will show as “MAGDBB”, when it is transmitting messages, any other routine may be reported.

```
3092* |TCP|60040 96 DICOM MAGDTCP3 161015,1997 7 0,0
      |TNT|localhost:1104|3092
```

#### 6.4.4 Display MUMPS System Information

This menu option displays the status of all system tasks. (This utility can also be invoked by typing **D ^%SI** at the command line in programmer mode.)

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #3 (MUMPS Utilities).
3. In the third menu, select #4 (Display MUMPS System Information).

The display typically will look like:

```
MSM - System Status
28-SEP-00  6:14 AM
```

The system has been up since 21-SEP-00 at 6:12 AM (7 days,2 minutes)  
when it was rebooted after a crash.

The active configuration is DICOM: Digital Imaging & Communications in Medicine

```
Maximum Users: 16           Active Users: 3           Socket Users: 1
Maximum Partitions: 21      Active Partitions: 14
Maximum Net Connections: 8  Current Net Connections: 2
Total disk buffers: 1024    Modified buffers: 0       Cache efficiency: 100.0%
```

#### Status of System Processes

System Process	Status	Job#	Job Status
MSM	system	1	Running
Telnet Service	Enabled		
Before Image Journaling	enabled		Volume Groups: DCM
MSM-Activatel service (TCPIP - 1666)	active	7	TCP_IO
Workstation service (TCPIP - 33086)	active	6	TCP_IO
PDQweb service (TCPIP - 2001)	not active		
User service DICOM CSTORE (TCPIP - 60000)	active	10	TCP_IO
User service MOD WORKLIST (TCPIP - 60010)	active	11	TCP_IO

In this report, the header shows the current date and time, which system configuration is running, and how long the system has been running.

The next block of information lists the maximum numbers for a number of resources and their actual usage.

The table at the bottom is the most important part of this report. This table shows which of the configured system processes are “active”. When this section of the report shows tasks that are “not active” or “crashed”, it is important to make certain that these tasks are (re)started using the appropriate system menu options.

The following system processes should be active in a VistA Imaging DICOM Gateway that is operating normally:

```
MSM                system        1        Running
MSM-Activatel service (TCPIP - 1666) active    7        TCP_IO
Workstation service (TCPIP - 33086) active    6        TCP_IO
```

In addition, Telnet and Before Image Journaling should be enabled:

```
Telnet Service      Enabled
Before Image Journaling enabled      Volume Groups:
                                         DCM
```

The two processes, **DICOM CSTORE** and **MOD WORKLIST** are used by the VistA Imaging DICOM Gateway, and should always be active:

```
User service DICOM CSTORE (TCPIP - 60000) active 10        TCP_IO
User service MOD WORKLIST (TCPIP - 60010) active 11        TCP_IO
```

The **DICOM CSTORE** must be running on the VistA DICOM Image, while the Gateway **MOD WORKLIST** must be running on the VistA DICOM Text Gateway. These can be re-initiated by shutting MSM down and restarting it.

The example shows **PDQweb service** as “not active”. This system service is not used by the VistA Imaging DICOM Gateway, and should never be active:

```
PDQweb service (TCP/IP - 2001)          not active
```

### 6.4.5 Display License Expiration Date

The VistA Imaging DICOM Gateway operates on top of a MUMPS system that is separately licensed. Licenses for MUMPS systems have a pre-determined expiration date. Since it is important to be able to extend a license before it expires, this menu option is provided to check the actual expiration date of the current license.

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #3 (MUMPS Utilities).
3. In the third menu, select #7 (Display License Expiration Date).

When this menu option is executed, it will report the expiration date of the license that is currently being used:

```
Cache Key display:
Based on the file 'c:\cachesys\mgr\cache.key'

LicenseCapacity = Cache 5.0 Enterprise - Concurrent Users for Intel
(Windows):800,

Multi-Server
CustomerName = VA CIOFO Silver Spring
OrderNumber = 200385564
ExpirationDate = 4/14/2033
AuthorizationKey = *****

MachineID =

currently available = 798
minimum available = 798
maximum available = 800
```

## 6.5 Enter Programmer's Mode

Access to Programmer's Mode is protected by an additional password. For information on how to re-define this password (see Chapter 8).

Use the Caché Terminal icon to start a session for this menu option.



After login, select the following menu options:

1. In the first menu, select #4 (System Maintenance).
2. In the second menu, select #4 (Enter Programmer's Mode).

This menu-option is included for use by VistA support personnel.

**Note:** in the sample text below, the text “**password**” appears. Use a site-specific password that is appropriate.

The user will be prompted to enter the Programmer Access Code:

```
PROGRAMMER ACCESS CODE:  password <Enter> (Programmer Mode)
[DCM,DCE]>
```

**DO NOT EDIT ANY ROUTINES OR CHANGE ENTRIES IN ANY GLOBAL FILE.**





## Chapter 7      Correcting DICOM Failed Images

When images are “acquired”, a number of checks are made to make certain that the information that is stored in the database can be linked to the correct patient and medical procedures.

On occasion, VistA Imaging DICOM Gateway software may be unable to match one of the following items from a DICOM image header with an existing entry in the VistA Hospital Information System:

- Patient name
- Patient ID (Social Security Number)
- Accession Number (Radiology case number)

When this happens, the VistA Imaging DICOM Gateway will store information in the DICOM Failed Images File (#2006.575). Manual intervention may be used to correct any of the data items that are in error, after which another attempt may be made to add the information about the image(s) to the VistA database.

**Note:** The actual image file will remain in the directory D:\DICOM\Image\_In. Do not delete files from this directory.

The program that performs these corrections is available in the main VistA Hospital Information System through the Correct-DICOM File Entries [MAGD FIX DICOM FILE] menu option. This menu option should be assigned to responsible supervisory staff members, who should use it on a daily basis to correct all failed images as soon as possible.

In order to select an image to be fixed, three options are available:

- Select by patient
- Loop through the list of failed images
- Scan the list of failed images by date-range

When a failed image has been selected, the user can identify the correct patient and case-number for the image. This causes the correct patient and study to be assigned to the image. After this, the DICOM Image Gateway will be able to process the image correctly. Images that can not be identified can be deleted.

Below, a sample session is shown for each of the three selection options.

**Note:** The interaction for consults is identical to that for Radiology.

## 7.1 Selection by Patient

Select OPTION NAME: **MAGD FIX DICOM FILE** <Enter>

Correct RAD-DICOM File Entries

Select one of the following:

P	Patient
L	Loop thru file
D	Specify a Date Range

Update entries by: **P** <Enter> atient

Select DICOM Failed Images: **?** <Enter>

Answer with DICOM Failed Images **PATIENT**

Do you want the entire DICOM Failed Images List? **Y** <Enter> (Yes)

Choose from:

IMAGPATIENT,SIX	D:\DICOM\Image_In\A0002791.DCM
CASE#: 031298-<unknown>	DATE: Feb 24, 1999 MODALITY: CR1
IMAGPATIENT,ONE M.	D:\DICOM\Image_In\A0014799.DCM
CASE#: 062398-<unknown>	DATE: Feb 24, 1999 MODALITY: CR1
IMAGPATIENT,TWO N.	D:\DICOM\Image_In\F0000001.DCM
CASE#: 021097-4666	DATE: Apr 28, 1999 MODALITY: WALSH
IMAGPATIENT,SIX R.	D:\DICOM\Image_In\A0000034.DCM
CASE#: 091798-<unknown>	DATE: Sep 23, 1999 MODALITY: CR1
IMAGPATIENT,THREE O.	D:\DICOM\Image_In\A0014810.DCM
CASE#: 062498-<unknown>	DATE: Feb 24, 1999 MODALITY: CR1
IMAGPATIENT,FOUR P.	D:\DICOM\Image_In\A0014816.DCM
CASE#: 062498-<unknown>	DATE: Feb 24, 1999 MODALITY: CR1
IMAGPATIENT,FIVE Q.	D:\DICOM\Image_In\A0014803.DCM
CASE#: 061898-<unknown>	DATE: Feb 24, 1999 MODALITY: CR1

^

Select DICOM Failed Images: **IMAGPATIENT,FIVE Q.** <Enter>

D:\DICOM\Image\_In\A0014803.DCM

CASE#: 061898-<unknown> DATE: Feb 24, 1999 MODALITY: CR1

\*\*\*\*\*Processing entry\*\*\*\*\*

PATIENT: IMAGPATIENT,FIVE Q.	SSN: 666302197
RADIOLOGY CASE #: 061898-<unknown>	
Equipment: CR1	Model: NM
Date Processed: FEB 24,1999	Problem with: PATIENT
Comment: 061898-<unknown>	
Correcting file on server ID: A	
D:\DICOM\Image_In\A0014803.DCM	

Do you want to Correct this entry? (Y/N/D/Q)// **?** <Enter>

Please respond with one of the following codes.

Legend: Y=yes, N=no, D=delete, P=Previous entry, and Q=quit

Do you want to Correct this entry? (Y/N/D/Q)// **Y** <Enter>

Lookup by case number or patient name

Enter Case Number or Patient Name: **?** <Enter>

Enter an active case number in the following form '999'...

...or enter a completed case number as 'MMDDYY-999'

...or enter a patient's name

...or enter a patient's 9-digit SSN

...or enter the first character of the patient's  
last name and the last four digits of their SSN.

Do you wish to see the entire list of active cases? NO// <Enter>

Enter Case Number or Patient Name: **IMGPATIENT,SIX R.** <Enter>

Select RAD/NUC MED PATIENT: IMGPATIENT,SIX R. // IMGPATIENT,SIX R. 01-06-44  
000086293

NO NON-VETERAN (OTHER)

\*\*\* WARNING \*\*\*

Case Lookup by Patient

Patient's Name: IMGPATIENT,SIX R. 000086293

Run Date: OCT 26,1999

Case No.	Procedure	Exam Date	Status of Exam	Imaging Loc
1	106	RENAL ULTRASOUND	09/23/99	WAITING FOR EXAM NUCLEAR MED
2	93	RENAL ULTRASOUND	03/30/99	CANCELLED ONCOLOGY CL
3	90	SPINE LUMBOSACRAL MIN 2 VI	02/19/99	WAITING FOR EXAM ONCOLOGY CL
4	72	(i)CT ABDOMEN W/CONT	09/23/98	WAITING FOR EXAM RADIOLOGY C
5	71	CT ABDOMEN W&W/O CONT	09/21/98	CANCELLED RADIOLOGY C
6	88	RENAL ULTRASOUND	08/26/98	WAITING FOR EXAM RADIOLOGY C
7	75	CHEST 2 VIEWS PA&LAT	08/26/98	WAITING FOR EXAM RADIOLOGY C
8	70	CT ABDOMEN W&W/O CONT	08/04/98	COMPLETE CAT SCAN
9	71	CT ABDOMEN W/O CONT	08/04/98	COMPLETE CAT SCAN
10	72	CT ABDOMEN W&W/O CONT	08/04/98	COMPLETE CAT SCAN
11	14	CHEST 2 VIEWS PA&LAT	08/03/98	CANCELLED RADIOLOGY C
12	70	ABDOMEN 1 VIEW	06/27/98	COMPLETE RADIOLOGY C
13	42	UPPER GI AIR CONT W/O KUB	05/12/98	CANCELLED RADIOLOGY C
14	42	CT ABDOMEN W/CONT	03/25/97	COMPLETE RADIOLOGY C

\*\*\*DICOM Image information to correct:

Patient	Date Acquired	Case No.	Modality
IMAGPATIENT,FIVE Q.	FEB 24,1999	061898-<unknown>	NM

Type '^' to STOP, or

\*\*\*\*Please review the following: \*\*\*\*

Previous name: IMAGPATIENT,FIVE Q.

New name: IMAGPATIENT,SIX R.

Previous ssn: 000074067

New ssn: 000086293

Previous case #: 061898-<unknown>

New case #: 106

Social Security numbers do not match. Update? (Y/N/D/Q)// Y <Enter>

Will change the following:

\*\*\*\*Please review the following: \*\*\*\*

Previous name: IMAGPATIENT,FIVE Q.

New name: IMAGPATIENT,SIX R.

Previous ssn: 000074067

New ssn: 000086293

Previous case #: 061898-<unknown>

New case #: 106

Are you sure you want to correct this entry? ? No// <Enter> (No)

## 7.2 Looping through the list of failed images

Select OPTION NAME:      MAGD FIX DICOM FILE <Enter>

## Correct RAD-DICOM File Entries

Select one of the following:

P	Patient
L	Loop thru file
D	Specify a Date Range

Update entries by: **L** **<Enter>** oop thru file

```
*****Processing entry*****
```

```
PATIENT: IMAGPATIENT,THIRTEEN                      SSN: 666-11-4439
RADIOLOGY CASE #: 051299-105
Equipment: CR1                                         Model: CT
Date Processed: SEP 15,1999                          Problem with: PATIENT
Comment: 051299-105
Correcting file on server ID: A
D:\DICOM\Image_In\A0000012.DCM
Do you want to Correct this entry? (Y/N/D/Q)// <Enter>
*****Processing entry*****
```

```
PATIENT: IMAGPATIENT,SIX R.                      SSN: PHANTOM
RADIOLOGY CASE #: 091798-<unknown>
Equipment: CR1                                     Model: CT
Date Processed: SEP 23,1999                       Problem with: PATIENT
Comment: 091798-<unknown>
Correcting file on server ID: A
      D:\DICOM\Image_In\A0000034.DCM
Do you want to Correct this entry? (Y/N/D/Q/P)// Y <Enter>
Lookup by case number or patient name
```

Enter Case Number or Patient Name: IMAGPATIENT,SIX R. <Enter>  
Select RAD/NUC MED PATIENT: IMAGPATIENT,SIX R.// IMAGPATIENT,SIX R. 01-06-44  
000086293  
NO NON-VETERAN (OTHER)

NO NON-VETERAN (OTHER)

\*\*\* WARNING \*\*\*  
Case Lookup by Patient

Patient's Name: IMAGPATIENT,SIX R. 000086293 Run Date: OCT 26,1999

Case No.	Procedure	Exam Date	Status of Exam	Imaging Loc	
1	106	RENAL ULTRASOUND	09/23/99	WAITING FOR EXAM	NUCLEAR MED
2	93	RENAL ULTRASOUND	03/30/99	CANCELLED	ONCOLOGY CL
3	90	SPINE LUMBOSACRAL MIN 2 VI	02/19/99	WAITING FOR EXAM	ONCOLOGY CL
4	72	(i)CT ABDOMEN W/CONT	09/23/98	WAITING FOR EXAM	RADIOLOGY C
5	71	CT ABDOMEN W&W/O CONT	09/21/98	CANCELLED	RADIOLOGY C
6	88	RENAL ULTRASOUND	08/26/98	WAITING FOR EXAM	RADIOLOGY C
7	75	CHEST 2 VIEWS PA&LAT	08/26/98	WAITING FOR EXAM	RADIOLOGY C
8	70	CT ABDOMEN W&W/O CONT	08/04/98	COMPLETE	CAT SCAN
9	71	CT ABDOMEN W/O CONT	08/04/98	COMPLETE	CAT SCAN
10	72	CT ABDOMEN W&W/O CONT	08/04/98	COMPLETE	CAT SCAN
11	14	CHEST 2 VIEWS PA&LAT	08/03/98	CANCELLED	RADIOLOGY C
12	70	ABDOMEN 1 VIEW	06/27/98	COMPLETE	RADIOLOGY C
13	42	UPPER GI AIR CONT W/O KUB	05/12/98	CANCELLED	RADIOLOGY C
14	42	CT ABDOMEN W/CONT	03/25/97	COMPLETE	RADIOLOGY C

\*\*\*DICOM Image information to correct:

Patient	Date Acquired	Case No.	Modality
IMAGPATIENT,SIX R.	SEP 23,1999	091798-<unknown>CT	

Type '^' to STOP, or

\*\*\*\*Please review the following: \*\*\*\*

Previous name: IMAGPATIENT,SIX R.  
 New name: IMAGPATIENT,SEVEN S.  
 Previous ssn: PHANTOM  
 New ssn: 000086293  
 Previous case #: 091798-<unknown>  
 New case #: 080498-70

Social Security numbers do not match. Update? (Y/N/D/Q/P)// **D <Enter>**

\*\*\*\*\*

\*\*\* Will log in error log (file 2006.599). \*\*\*

Please enter a reason for deleting.  
 For example: TEST PATIENT  
 Reason for deletion: **<Enter>**  
 This is a required response. Enter '^' to exit  
 Please enter a reason for deleting.  
 For example: TEST PATIENT  
 Reason for deletion: ^ **<Enter>**  
 Can not delete if a reason is not provided.  
 \*\*\*\*\*Processing entry\*\*\*\*\*

PATIENT: IMAGPATIENT,SEVEN S.	SSN: 000-52-4439
RADIOLOGY CASE #: 5528	
Equipment: CR1	Model: CT
Date Processed: OCT 8,1999	Problem with: PATIENT
Comment: 5528	\F/U

\

Correcting file on server ID: A  
 D:\DICOM\Image\_In\A0000192.DCM

Do you want to Correct this entry? (Y/N/D/Q/P)// **Q <Enter>**

### 7.3 Scanning the list of failed images by date-range

Select OPTION NAME: **MAGD FIX DICOM FILE <Enter>**  
 Correct RAD-DICOM File Entries

Select one of the following:

P	Patient
L	Loop thru file
D	Specify a Date Range

Update entries by: **D <Enter>** Specify a Date Range  
 Enter start date: **T-20 <Enter>**  
 Enter stop date: **T-10 <Enter>**  
 \*\*\*\*\*Processing entry\*\*\*\*\*

PATIENT: IMAGPATIENT,SEVEN S.	SSN: 000-52-4439
RADIOLOGY CASE #: 5528	
Equipment: CR1	Model: CT
Date Processed: OCT 8,1999	Problem with: PATIENT
Comment: 5528	\F/U

\

Correcting file on server ID: A

```
D:\DICOM\Image_In\A0000192.DCM
Do you want to Correct this entry? (Y/N/D/Q)//
. . .
```

In any of the cases that the question “**Are you sure you want to Update?**” is asked, responding with a “**D**” will cause deletion of the image file on the server and will record the deletion in a log file.

The DICOM Failed Images File (#2006.575) file may have many entries. Sometimes, however, this option will only loop through a few studies, because a single study, like a CT scan, can have a large number of image files associated with it.

## Chapter 8 Re-Define Access and Verify Codes

### 8.1 Overview

The procedure to modify access and verify codes is not directly available from any of the menus in order to provide an additional level of security and protection to prevent these codes from being changed inadvertently.

In order to modify the access or verify code, first obtain programmer's access (see Section 6.5). With programmer's access, follow the dialog below.

**Note:** In the sample text below, the text “**password**” appears several times. For each instance, use a different site-specific password for each code.

```
>DO INIT^MAGDLOGN <Enter>
```

```
Change Login Security Codes
```

```
-----
```

- 1 - Change ACCESS Code
- 2 - Change VERIFY Code
- 3 - Change PROGRAMMER ACCESS Code
- 4 - Change PRINT/VIEW ONLY Code
- 5 - Change SUPPORT Code
  
- A - Change ALL THE CODES

```
Enter 1-5 or "A" to change security codes, <Enter> to exit: 5 <Enter>
```

```
Enter new SUPPORT code: password <Enter>
```

```
Re-enter SUPPORT code (to make sure I got it right): password <Enter>
```

The system requires that the “**password**” be a combination of six or more letters and numbers. It is not case-sensitive, however.

**Note:** When a user logs on using the password for “**Print/View Only**”, the only menu options that will be available are those that cannot modify the database. When the passwords for “normal” access and “View Only” access are the same, the most restrictive access will be granted (i.e. View Only).

**(end of Section)**



# Chapter 9 Text Gateway File Modes of Operation

## 9.1 Overview

The VistA Imaging DICOM Gateway has two different mechanisms for handling text files. One mode of operation (DIRECT) is designed to handle incoming query requests, while the other (FIFO QUEUE) supports broadcasting messages to multiple destinations.

## 9.2 DIRECT Mode of Operation

In some applications, like responding to Modality Worklist queries, where the VistA Imaging DICOM Gateway operates as a server and handles individual requests, one process performs both the communication and the message handling functions. In these instances, one set of files in the D:\DICOM\DATA1\LOGxxx.nnn directory (where “xxx” is the 3-letter system name, and “nnn” is the MUMPS job number) is used to pass the messages between the message handler and the communications phases of the same process (see Table 9.2).

**Files Used in the DIRECT Mode of Operation**

File Name	Usage	Type
INCOMING.PDU	Incoming association control protocol data units	Binary
OUTGOING.PDU	Outgoing association control protocol data units	Binary
INCOMING.DCM	Incoming DICOM message	DICOM
INCOMING.TXT	Text of incoming DICOM message	ASCII Text
OUTGOING.DCM	Outgoing DICOM message	DICOM
OUTGOING.TXT	Text of outgoing DICOM message	ASCII Text

**Table 9.2**

## 9.3 FIFO QUEUE Mode of Operation

In other applications, like the PACS text interface, where the VistA Imaging DICOM Gateway processes, stores, and forwards messages, separate message handling and communications processes are used, and the incoming and outgoing files that are passed between them are organized in prioritized first-in-first-out queues.

A queue consists of a numerically ordered sequence of message files, and pointers to the last written and last read files in the sequence. The queue pointer files, one for writing to the queue and one for reading from the queue are located in the root directory for the queue, D:\DICOM\DATA1, for example, while the actual message files are stored one level below in subdirectories.

Each DICOM application entity (AE) generates a queue of **immediate**, **high**, **medium**, and **low** priority DICOM request and response messages for the other system to process. For each priority, these messages are stored in sequentially numbered files, and are processed in first-in-first-out order. A response message is returned for each request message. Separate message

queues are used to store the **immediate**, **high**, **medium**, and **low** priority request messages and their responses.

Sixteen queues handle the messages sent in each direction. Each queue is assigned a letter: A, B, C, D, E, F, G, and H are for the remote application entity request and response queues, and S, T, U, V, W, X, Y, and Z are for the VistA request and response queues (see Table 9.3).

### Prioritized First-In-First-Out Queues

Application Entity	Queue Request – Response	Priority	Usage
Remote	A – B	High	
	C – D	Medium	
	E – F	Low	
	G – H	Immediate	C-ECHO only
VistA	S – T	Immediate	C-ECHO only
	U – V	High	Orders and Examination Verification
	W – X	Medium	ADT, Patient Demographics and Reports
	Y – Z	Low	Pull Lists

**Table 9.3**

Queues A, C, E, and G are for requests from remote AEs and B, D, F, and H are for their corresponding responses from VistA. Queues S, U, W, and Y are for requests from VistA and T, V, X, and Z for their corresponding responses from the remote AEs.

The DICOM message files are named Lnnnnnnn.DCM, where “L” is the queue letter, “nnnnnnn” is a sequentially assigned 7-digit number, and DCM is the message extension. (Depending on a configuration parameter, there may also be a Lnnnnnnn.TXT file, an ASCII formatted listing of the DICOM file.) The DICOM message files are stored in subdirectories in groups of one hundred. The queue subdirectories are named Lnnnnn, where “L” is the queue letter and “nnnnn” is a five-digit number. (For example, subdirectory L12345 holds message files L1234500.DCM through L1234599.DCM.)

Each queue has a pair of pointer files named as follows: L\_READ.PTR and L\_WRITE.PTR where L is the letter of the queue (A-H, or S-Z). There are a total of thirty-two pointer files located in the root directory of the queue. The \*\_READ.PTR is used by the VistA application reading from the queue and the \*\_WRITE.PTR is used by the VistA application writing to the queue. Note that depending upon the direction of the message, the VistA message handler and TCP/IP communicator can either be the queue reading or the writing application.

### 9.3.1 Queue Pointer File

The value of the queue pointer file is the sequential number of the last file that has been written to the queue, or the sequential number of the last file that has been read from the queue. Each queue pointer is stored in the file as a single record consisting of a seven-digit right justified ASCII numeric string terminated with <carriage return> <line feed>. The numbers are sequentially assigned in the inclusive range of 0-9999999. The initial value for the queue pointer is zero ("0000000"). When the last number ("9999999") is reached, the counter will reset and the next number will be zero ("0000000").

#### **Example:**

In this example, the VistA system is sending messages to a commercial PACS using queue "W". The VistA message handler has placed thirty messages on the queue and the VistA TCP/IP communications process has sent twenty-eight of them to the commercial PACS.

W\_WRITE.PTR contains the ASCII number twenty-nine ("000029"), followed by <carriage return> <line feed>. (Remember, counting starts with zero!)

W\_READ.PTR contains the ASCII number twenty-seven ("000027"), followed by <carriage return> <line feed>.

The following message files exist in subdirectory W00000:

W0000000.DCM	
W0000001.DCM	
W0000002.DCM	
...	
W0000027.DCM	W_READ.PTR=0000027
W0000028.DCM	
W0000029.DCM	W_WRITE.PTR=0000029

**Note:** There may also be thirty W00000nn.TXT files as well.

### 9.3.2 Processing Algorithm – Message Source

When the source process puts a message into the queue, it must first read its queue write pointer file value "nnnnnnn" and increment it by one<sup>3</sup>. The source process must then create the message file on the queue with the temporary name Lnnnnnnn+1.TMP. When the message file is completely written, the source process must rename the message file to Lnnnnnnn+1.DCM, and store the incremented "nnnnnnn+1" value back into the queue write pointer file.

The extra step of creating the message file first with a temporary name, and then renaming it, is necessary to prevent a race condition where the message destination process could try to read the message file before it was completely written.

---

<sup>3</sup>The numbers are in the inclusive range of 0-9999999. The increment step must reset the counter at the end of the range.

### 9.3.3 Processing Algorithm – Message Destination

The destination process must satisfy any **immediate** requests before handling any **high** requests, all **high** requests before handling any **medium** requests, and all **medium** requests before handling any **low** requests. Response messages are processed in a similar prioritized fashion after all the request messages are done.

1. The destination process reads the **immediate** queue read pointer file and checks for existence of the next **immediate** request message file (G/Snnnnnnn+1.DCM) in the **immediate** queue.
2. If the next **immediate** request message file exists, the destination process reads it, performs the designated functions, and outputs the next response file to the destination process's **immediate** response queue. It then updates the **immediate** request queue read pointer file with the next value, and repeats the cycle (at step 1).
3. If the next **immediate** request message file does not exist, the process reads the **high** request queue read pointer file and checks for existence of the next **high** request message file (A/Unnnnnnn+1.DCM) in the **high** request queue.
4. If the next **high** request message file exists, the destination process reads it, performs the designated functions, and outputs the next response file to the destination process's **high** response queue. It then updates the **high** request queue read pointer file with the next value, and repeats the cycle (at step 1).
5. If the next **high** request message file does not exist, the process reads the **medium** request queue read pointer file and checks for existence of the next **medium** request message file (C/Wnnnnnnn+1.DCM) in the **medium** request queue.
6. If the **medium** routine request message file exists, the destination process reads it, performs the designated functions, and outputs the next response file to the destination process's **medium** response queue. It then updates the **medium** request queue read pointer file with the next value, and repeats the cycle (at step 1).
7. If the next **routine** request message file does not exist, the process reads the **low** request queue read pointer file and checks for existence of the next **low** request message file (E/Ynnnnnnn+1.DCM) in the **low** request queue.
8. If the next **low** request message file exists, the destination process reads it, performs the designated functions, and outputs the next response file to the destination process's **low** request queue. It then updates the **low** request queue read pointer file with the next value, and repeats the cycle (at step 1).
9. If the next **low** message request message file does not exist, the destination process reads the first outstanding response message and repeats the cycle (at step 1).
10. If no outstanding response messages exist, the process hibernates for a specified period of time (one second), and then repeats the cycle (at step 1).

### **9.3.4 Message Queue File Deletion**

Old message files and status files are automatically deleted after a predefined number of days by a VistA batch job.

**(end of Section)**

## Chapter 10 Image Acquisition Devices - Modalities

**Note:** This chapter describes the steps to be undertaken to define the initial set of image acquisition devices and modalities, and how to modify the configuration at a later time to add more devices.

Begin by taking an inventory of all of the image acquisition devices and mapping them to the VistA DICOM Image Gateways. Such an inventory should include the information shown in tables 10.1 and 10.2. Then register each instrument with the VistA Modality Worklist Provider on the VistA DICOM Text Gateway. Section 10.3 presents the details on how to do this. Finally, setup the image processing parameters for each different instrument modality. This is described below in Section 10.4.

### 10.1 Image producing equipment

Table 10.1 contains information about all image acquisition equipment at the site. (The example below shows equipment at a fictitious site.) Site personnel have assigned port numbers for the VistA DICOM Storage processes different pieces of equipment, based upon the scheme described in the VistA Imaging DICOM Installation Guide.

**Note:** The parameters that are shown in the shaded columns in table 10.1 will be entered in the **F:\DICOM\Dict\Instrument.DIC** master file (see also the VistA Imaging DICOM Gateway Installation Guide Chapter 8).

Instrument Name	VA Network Name	IP Address	Port Assigned	Mnemonic	Location	Imaging Service
DeJarnette ImageShare	VHAXXIMG1	111.222.333.229	60100	CR1	2D-130	RAD
DeJarnette ImageShare	VHAXXIMG2	111.222.333.230	60101	CR2	C2-72	RAD
DeJarnette ImageShare	VHAXXIMG3	111.222.333.231	60102	CR3	OPC	RAD
GE CT/i CT Scanner	VHAXXCTS1	111.222.333.111	60120	CT1	2D-124	RAD
OEC C-Arm 9400	VHAXXOEC1	111.222.333.120	60140	DRS1	Portable	RAD
OEC C-Arm 9700	VHAXXOEC2	111.222.333.121	60141	DRS2	Portable	RAD
Acuson 128 Ultrasound	VHAXXACU1	111.222.333.117	60160	US1	Portable	RAD
Acuson 128 Ultrasound	VHAXXACU2	111.222.333.118	60161	US2	Portable	RAD
Acuson 128 Ultrasound	VHAXXACU3	111.222.333.119	60162	US3	Portable	RAD
ADAC Vertex	VHAXXADAC1	111.222.333.178	60170	NM1	2D-166	RAD
ADAC Solus	VHAXXADAC2	111.222.333.184	60171	NM2	2D-163	RAD
ADAC Siemens Basicam	VHAXXADAC3	111.222.333.185	60172	NM3	2D-162	RAD
ADAC Siemens Orbiter	VHAXXADAC4	111.222.333.177	60173	NM4	2D-158	RAD
Lumisys 75	VHAXXLUM1	111.222.333.150	60190	LUMISYS	2D-116	RAD
GE Advantage Workstation	VHAXXAWS1	111.111.333.113	60200	ADW1	2D-135	RAD
Philips EasyVision	VHAXXEVI	111.222.333.130	60201	EV1	2D-155	RAD
Philips MRI	VHAXXMRI1	111.222.333.131	60300	MRI1	2D-155	RAD
Olympus EndoWorks	VHAXXENDO1	111.222.333.140	60400	ENDO1	4E-124	CON

**Table 10.1**

**Note:** All imaging instruments should be assigned unique port numbers for storage, even though different VistA DICOM Image Gateways are going to provide the service. This convention is highly recommended because it allows the instruments to be easily reassigned to a different processor, in the event of a hardware failure.

## 10.2 Distribute Modalities over Processors

Table 10.2 has a column for each processor at the site. The rows in this table indicate how the image producing modalities are distributed over the processors, e.g.:

Gateway	VHAXXXDIG1	VHAXXXDIG2	VHAXXXDIG3	VHAXXXDIG4	VHAXXXDIG5
IP Address:	111.222.333.238	111.222.333.239	111.222.333.240	111.222.333.241	111.222.333.242
Allocation Mnemonic	CT1	MRI1	CR1	CR2	CR3
	DRS1	DRS2	US1	US2	US3
	NM1	NM2	NM3	NM4	ENDO1
	LUMISYS		ADW1	EV1	

**Table 10.2**

## 10.3 Image Acquisition

### 10.3.1 Add IP Addresses to HOSTS File

When a modality connects to a VistA Imaging DICOM Gateway, the gateway attempts to determine the network identity (i.e., the IP address) of the modality that is making the connection. It does this by invoking the Windows operating system function `gethostbyaddr()`. This works most efficiently when the IP address of the instrument is registered in the VistA Imaging DICOM Gateway's **"HOSTS"** file. (The full name of this file is typically `c:\WinNT\System32\Drivers\etc\hosts`.)

For each instrument, add the information from the columns labeled **"Instrument IP Address"** and **"Mnemonic"** (in that order), separated by a tab-character, to the **"HOSTS"** file. A comment may be entered anywhere in the line, beginning with the sharp **"#"** character.

The following is an example of a **"HOSTS"** file.

```
127.0.0.1      localhost

# local host telnet connections for the VistA DICOM PACS Interface
127.0.0.1      TEXT_INTERFACE_1_1          # HIS to DICOM Test Interface
127.0.0.1      MITRA_BROKER_1_2_1          # MITRA / FUJI Communications
127.0.0.1      DEJARNETTE_MEDISHARE_1_2_2  # DEJARNETTE / FUJI Communications
127.0.0.1      PACS_EXAM_COMPLETE_2_1      # Receiver for exam complete
127.0.0.1      PACS_REQUEST_IMAGE_TRANSFER_2_2 # Request image transfer from PACS
127.0.0.1      PROCESS_DICOM_IMAGES_2_3    # Process DICOM Images
127.0.0.1      IMAGE_STATUS_2_5           # Status of Image Transfer/Processing

# Frequently used IP addresses
111.222.333.130 VistA                    # HIS/RIS

111.222.333.40  GECT1                    # GE High Speed CTI, Room F24
111.222.333.41  GEADW                    # GE Advantage Workstation F24
111.222.333.42  GEMR                     # GE Signa MRI, Room Mobile Trailer
#End of File
```

### 10.3.2 Configuring the Instruments

Once the instruments have been assigned port numbers on a VistA DICOM Image Gateway, it is necessary to configure them with the corresponding network parameters of the VistA DICOM Service Class Provider (SCP), as shown in table 10.3.



Storage SCP		Required Values
	IP Address	VistA DICOM Image Gateway's IP Address
	Port Number	Port number assigned for the Instrument
	Called AE Title	<b>VISTA_STORAGE</b>
Modality Worklist SCP		
	IP Address	VistA DICOM Text Gateway's IP Address
	Port Number	<b>60010</b>
	Called AE Title	<b>VISTA_WORKLIST</b>

Table 10.3

### 10.3.3 Registering the Instrument with VistA Modality Worklist SCP

In order for the instrument to utilize the VistA Modality Worklist service, the instrument must first be properly registered with the VistA Imaging DICOM Gateway. The DICOM Application Entity Title of the image acquisition device, its location, imaging service, the accession number format (Short or Long), and a description of the instrument must be entered in the **F:\DICOM\Dict\WorkList.DIC** master file (see also the VistA Imaging DICOM Gateway Installation Guide, Chapter 8). Typical data in this file might look like:

```
#AE Title|Institution Name|Imaging Service|Imaging Type|S/L|Description
IM_CR|sitename|RAD|RAD|LONG|DeJarnette Fuji CR
MS_FCRIDGW|sitename|RAD|RAD|LONG|DeJarnette Fuji CR
SCANNER1|sitename|RAD|RAD|LONG|Film Scanner
OLYMPUS_ENDO1|sitename|CON||LONG|Endoscopy
```

**Note:** The column in this file that reads “*sitename*” in this and the following examples should be replaced by the actual name (or number) of the location as it occurs in the Institution file (stored in ^DIC(4,...)).

The data in **WorkList.DIC** must be loaded into the VistA Imaging DICOM Gateway via the corresponding master file build routine as described above in Section 6.3.7.

### 10.3.4 Registering the Instrument with VistA Storage Provider SCP

The parameters that are shown in the shaded columns in table 10.1 will be entered in the **F:\DICOM\Dict\Instrument.DIC** master file (see also the VistA Imaging DICOM Gateway Installation Guide, Appendix B.4.1). For the above site, the contents of this file would look like:

```
# Mnemonic|Description|Institution Name|Imaging Service|Port
CR1|DeJarnette ImageShare, 2D-130|sitename|RAD|60100
CR2|DeJarnette ImageShare, C2-72|sitename|RAD|60101
CR3|DeJarnette ImageShare, |sitename|RAD|60102
CT1|GE CT/i CT Scanner, 2D-124|sitename|RAD|60120
DRS1|OEC C-Arm 9400, Portable|sitename|RAD|60140
DRS2|OEC C-Arm 9700, Portable|sitename|RAD|60141
US1|Acuson 128 Ultrasound, Portable|sitename|RAD|60160
US2|Acuson 128 Ultrasound, Portable|sitename|RAD|60161
US3|Acuson 128 Ultrasound, Portable|sitename|RAD|60162
```

```
NM1|ADAC Vertex, 2D-166|sitename|RAD|60170
NM2|ADAC Solus, 2D-163|sitename|RAD|60171
NM3|ADAC Siemens Basicam, 2D-162|sitename|RAD|60172
NM4|ADAC Siemens Orbiter, 2D-158|sitename|RAD|60173
LUMISYS|Lumisys 75, 2D-116|sitename|RAD|60190
ADW1|GE Advantage Workstation, 2D-135|sitename|RAD|60200
EV1|Philips EasyVision|sitename|RAD|60201
MRI1|Philips MRI|sitename|RAD|60300
END01|Olympus EndoWorks|sitename|CON|60400
```

The data in **Instrument.DIC** must be loaded into the VistA Imaging DICOM Gateway via the corresponding master file build routine as described above in Section 6.3.3.

Once the **F:\DICOM\Dict\Instrument.DIC** master file has been created (or each time it is updated), the “Create Shortcuts for Instruments” menu option can be run to create the shortcuts for the various instruments (see Section 6.3.9).

## 10.4 Setting up DICOM Image Processing

### 10.4.1 Registering the Type of Modality with VistA

After an entry has been added to **F:\DICOM\Dict\Instrument.DIC** for the image acquisition device (and the corresponding configuration are made on the instrument), the device may start transmitting images to the VistA Imaging DICOM Gateway.

Before images can be processed correctly, however, the image acquisition device must have a corresponding entry in the **F:\DICOM\Dict\Modality.DIC** master file.

Image processing is a six-step process performed automatically by the VistA DICOM Image Gateway (see Section 4.11 for more details):

1. Determine the manufacturer, model, and modality (obtain this information from the image header).
2. Obtain the accession number from the image header (different manufacturers store the accession number in different places for different models, so various methods are needed).
3. Look up patient and study.
4. Get number of bits per pixel, x and y dimensions and process the image (convert to TARGA™, if necessary, create .BIG file, if necessary, create the abstract file).
5. Store the images.
6. Format the DICOM text information for VistARad and store it in the .TXT file.

The master file named **F:\DICOM\Dict\Modality.DIC** provides the parameters used to control these steps.

If an image acquisition instrument does not have a corresponding entry in that master file, when the image is being processed by the function “**Process DICOM Images**” (see Section 4.11), the following warning message may be displayed:

```
D:\DICOM\Image_In\A0000001.DCM -- ULTRASOUND^GE^^ -- 000-00-0000
*****
```

```

*** DICOM IMAGE PROCESSING WARNING ***
*** The following device is not yet defined in the system: ***
*** Mfgr: G.E. Medical Systems Model: LOGIQ 700 Modality: US ***
*****

```

A warning message is also output by menu option “**Display Real-Time Storage Server Statistics**” (see Section 4.13).

```

*** The following images have undefined modalities ***

```

Manufacturer	Model	Modality	#Images
G.E. Medical Systems	LOGIQ 700	US	2
LUMISYS	LS75	CR,DX	3
Philips Medical Systems	Cassette Holder Type 9840 500 70201CR		1
VAMC Image Acquisition Corp.	VA Image Camera	OT	1

Information about the image can be shown using the menu-option “**Display a DICOM Image Header**” (see Section 4.17).

DUMP of DICOM file D:\DICOM\Image\_In\A0000001.DCM

```

O      G      E      L      Created at 11:17 AM on 18-AUG-1999
f      r      l      e
f      o      e      n
s      u      m      g
e      p      e      t
t      n      h      A t t r i b u t e      V a l u e
                        -----
000084:0002,0000 UL 0004 Group Length      "206 (0x000000CE)"
000090:0002,0001 OB 0002 File Meta Information Ver "0 (0x00)"
                        "1 (0x01)"
00009E:0002,0002 UI 001C Media Storage SOP Class U "1.2.840.10008.5.1.4.1.1.6.1"
                        Ultrasound Image Storage
0000C2:0002,0003 UI 0034 Media Storage SOP Instanc "1.2.840.11361907579238402167
                        ... 00.4.0.1.19970120102042"
0000FE:0002,0010 UI 0012 Transfer Syntax UID      "1.2.840.10008.1.2"
                        Implicit VR Little Endian
000118:0002,0012 UI 0016 Implementation Class UID "1.2.840.113754.2.1.1.0"
000136:0002,0013 SH 000E Implementation Version Na "VA DICOM V2.5"
00014C:0002,0016 AE 000A Source Application Entity "DICOM_TEST"
00015E:0008,0008 CS 001C Image Type
                        "ORIGINAL"
                        "PRIMARY"
                        "OBSTETRICAL"
000182:0008,0016 UI 001C SOP Class UID
                        "1.2.840.10008.5.1.4.1.1.6.1"
                        Ultrasound Image Storage
0001A6:0008,0018 UI 0034 SOP Instance UID
                        "1.2.840.11361907579238402167
                        ... 00.4.0.1.19970120102042"
0001E2:0008,0020 DA 0008 Study Date
                        "19970120"
0001F2:0008,0030 TM 0006 Study Time
                        "102042"
000200:0008,0050 SH 0000 Accession Number
                        "<unknown>"
000208:0008,0060 CS 0002 Modality
                        "US"
000212:0008,0070 LO 0014 Manufacturer
                        "G.E. Medical Systems"
00022E:0008,0080 LO 0012 Institution Name
                        "GE MEDICAL SYSTEMS"
000248:0008,0090 PN 0000 Referring Physician's Nam "<unknown>"
000250:0008,1010 SH 0006 Station Name
                        "mvme22"
00025E:0008,1090 LO 000A Manufacturer's Model Name "LOGIQ 700"
000270:0008,2122 IS 0002 Stage Number
                        "0"
00027A:0008,2124 IS 0002 Number of Stages
                        "1"
000284:0008,2128 IS 0002 View Number
                        "0"
00028E:0008,212A IS 0002 Number of Views in Stage "1"

```

```

000298:0010,0010 PN 0010 Patient's Name "IMAGPATIENT1^ONE^^"
0002B0:0010,0020 LO 000C Patient ID "000-00-0000"
0002C4:0010,0030 DA 0000 Patient's Birth Date "<unknown>"
0002CC:0010,0032 TM 0000 Patient's Birth Time "<unknown>"
0002D4:0010,0040 CS 0002 Patient's Sex "F"
0002DE:0010,1020 DS 0008 Patient's Size "0.000000"
0002EE:0010,1030 DS 0008 Patient's Weight "0.000000"
0002FE:0010,21B0 LT 0000 Additional Patient Histor "<unknown>"
000306:0018,1000 LO 0008 Device Serial Number "4121885"
000316:0018,1020 LO 0006 Software Version(s) "R1.0.D"
000324:0018,6011 SQ FFFF Sequence of Ultrasound Re 1
00032C:FFFE,E000 SQ FFFF >Item Begin 1.1
000334:0018,6012 US 0002 >Region Spatial Format "0 (0x0000)"
00033E:0018,6014 US 0002 >Region Data Type "0 (0x0000)"
000348:0018,6016 UL 0004 >Region Flags "0 (0x00000000)"
000354:0018,6018 UL 0004 >Region Location Min X0 "0 (0x00000000)"
000360:0018,601A UL 0004 >Region Location Min Y0 "0 (0x00000000)"
00036C:0018,601C UL 0004 >Region Location Max X1 "0 (0x00000000)"
000378:0018,601E UL 0004 >Region Location Max Y1 "0 (0x00000000)"
000384:0018,6020 SL 0004 >Reference Pixel X0 "0 (0x00000000)"
000390:0018,6022 SL 0004 >Reference Pixel Y0 "0 (0x00000000)"
00039C:0018,6024 US 0002 >Physical Units X Directi "0 (0x0000)"
0003A6:0018,6026 US 0002 >Physical Units Y Directi "0 (0x0000)"
0003B0:0018,6028 FD 0008 >Reference Pixel Physical "0"
0003C0:0018,602A FD 0008 >Reference Pixel Physical "0"
0003D0:0018,602C FD 0008 >Physical Delta X "0"
0003E0:0018,602E FD 0008 >Physical Delta Y "0"
0003F0:0018,6030 UL 0004 >Transducer Frequency "0 (0x00000000)"
0003FC:0018,6032 UL 0004 >Pulse Repetition Frequen "0 (0x00000000)"
000408:FFFE,E00D SQ 0000 >Item End 1.1
000410:FFFE,E000 SQ FFFF >Item Begin 1.2
000418:0018,6012 US 0002 >Region Spatial Format "0 (0x0000)"
000422:0018,6014 US 0002 >Region Data Type "0 (0x0000)"
00042C:0018,6016 UL 0004 >Region Flags "0 (0x00000000)"
000438:0018,6018 UL 0004 >Region Location Min X0 "0 (0x00000000)"
000444:0018,601A UL 0004 >Region Location Min Y0 "0 (0x00000000)"
000450:0018,601C UL 0004 >Region Location Max X1 "0 (0x00000000)"
00045C:0018,601E UL 0004 >Region Location Max Y1 "0 (0x00000000)"
000468:0018,6020 SL 0004 >Reference Pixel X0 "0 (0x00000000)"
000474:0018,6022 SL 0004 >Reference Pixel Y0 "0 (0x00000000)"
000480:0018,6024 US 0002 >Physical Units X Directi "0 (0x0000)"
00048A:0018,6026 US 0002 >Physical Units Y Directi "0 (0x0000)"
000494:0018,6028 FD 0008 >Reference Pixel Physical "0"
0004A4:0018,602A FD 0008 >Reference Pixel Physical "0"
0004B4:0018,602C FD 0008 >Physical Delta X "0"
0004C4:0018,602E FD 0008 >Physical Delta Y "0"
0004D4:0018,6030 UL 0004 >Transducer Frequency "0 (0x00000000)"
0004E0:0018,6032 UL 0004 >Pulse Repetition Frequen "0 (0x00000000)"
0004EC:FFFE,E00D SQ 0000 >Item End 1.2
0004F4:FFFE,E000 SQ FFFF >Item Begin 1.3
0004FC:0018,6012 US 0002 >Region Spatial Format "0 (0x0000)"
000506:0018,6014 US 0002 >Region Data Type "0 (0x0000)"
000510:0018,6016 UL 0004 >Region Flags "0 (0x00000000)"
00051C:0018,6018 UL 0004 >Region Location Min X0 "0 (0x00000000)"
000528:0018,601A UL 0004 >Region Location Min Y0 "0 (0x00000000)"
000534:0018,601C UL 0004 >Region Location Max X1 "0 (0x00000000)"
000540:0018,601E UL 0004 >Region Location Max Y1 "0 (0x00000000)"
00054C:0018,6020 SL 0004 >Reference Pixel X0 "0 (0x00000000)"
000558:0018,6022 SL 0004 >Reference Pixel Y0 "0 (0x00000000)"
000564:0018,6024 US 0002 >Physical Units X Directi "0 (0x0000)"
00056E:0018,6026 US 0002 >Physical Units Y Directi "0 (0x0000)"
000578:0018,6028 FD 0008 >Reference Pixel Physical "0"
000588:0018,602A FD 0008 >Reference Pixel Physical "0"

```

```

000598:0018,602C FD 0008 >Physical Delta X          "0"
0005A8:0018,602E FD 0008 >Physical Delta Y          "0"
0005B8:0018,6030 UL 0004 >Transducer Frequency      "0 (0x00000000)"
0005C4:0018,6032 UL 0004 >Pulse Repetition Frequen "0 (0x00000000)"
0005D0:FFFE,E00D SQ 0000 >Item End                  1.3
0005D8:FFFE,E000 SQ FFFF >Item Begin                 1.4
0005E0:0018,6012 US 0002 >Region Spatial Format      "0 (0x0000)"
0005EA:0018,6014 US 0002 >Region Data Type          "0 (0x0000)"
0005F4:0018,6016 UL 0004 >Region Flags              "0 (0x00000000)"
000600:0018,6018 UL 0004 >Region Location Min X0    "0 (0x00000000)"
00060C:0018,601A UL 0004 >Region Location Min Y0    "0 (0x00000000)"
000618:0018,601C UL 0004 >Region Location Max X1    "0 (0x00000000)"
000624:0018,601E UL 0004 >Region Location Max Y1    "0 (0x00000000)"
000630:0018,6020 SL 0004 >Reference Pixel X0        "0 (0x00000000)"
00063C:0018,6022 SL 0004 >Reference Pixel Y0        "0 (0x00000000)"
000648:0018,6024 US 0002 >Physical Units X Directi "0 (0x0000)"
000652:0018,6026 US 0002 >Physical Units Y Directi "0 (0x0000)"
00065C:0018,6028 FD 0008 >Reference Pixel Physical  "0"
00066C:0018,602A FD 0008 >Reference Pixel Physical  "0"
00067C:0018,602C FD 0008 >Physical Delta X          "0"
00068C:0018,602E FD 0008 >Physical Delta Y          "0"
00069C:0018,6030 UL 0004 >Transducer Frequency      "0 (0x00000000)"
0006A8:0018,6032 UL 0004 >Pulse Repetition Frequen "0 (0x00000000)"
0006B4:FFFE,E00D SQ 0000 >Item End                  1.4
0006BC:FFFE,E0DD SQ 0000 >Sequence End              1
0006C4:0020,000D UI 002A Study Instance UID          "1.2.840.113619.2.21.216.700.
... 0.757923840.4"
0006F6:0020,000E UI 002C Series Instance UID          "1.2.840.113619.2.21.216.700.
... 0.757923840.4.0"
00072A:0020,0010 SH 0002 Study ID                    "4"
000734:0020,0011 IS 0002 Series Number               "0"
00073E:0020,0013 IS 0002 Image Number                "1"
000748:0020,0020 CS 0000 Patient Orientation         "<unknown>"
000750:0028,0002 US 0002 Samples per Pixel           "1 (0x0001)"
00075A:0028,0004 CS 000C Photometric Interpretatio "MONOCHROME2"
00076E:0028,0010 US 0002 Rows                       "480 (0x01E0)"
000778:0028,0011 US 0002 Columns                    "640 (0x0280)"
000782:0028,0100 US 0002 Bits Allocated              "8 (0x0008)"
00078C:0028,0101 US 0002 Bits Stored                 "8 (0x0008)"
000796:0028,0102 US 0002 High Bit                    "7 (0x0007)"
0007A0:0028,0103 US 0002 Pixel Representation        "0 (0x0000)"
0007AA:7FE0,0010 OB B000 Pixel Data                  "<image>"
"length=307200 (0x0004B000)"
"offset=1970 (0x07B2)"

```

End of File D:\DICOM\Image\_In\A0000001.DCM (printed 11:23 AM 18-AUG-99)

In the above print-out, a number of lines are highlighted. The information from these lines is used for the parameters that need to be entered into **d:\DICOM\Modality.DIC**.

DICOM Element	Name
(0008,0070)	Manufacturer
(0008,1090)	Model
(0008,0060)	Modality

**Table 10.4**

### 10.4.2 Format of entries in Modality.DIC

For a specification of the format and content of this master file, see the VistA Imaging DICOM Gateway Installation Guide, Appendix B.4.2.

The parameters in the line to be constructed are:

1. Manufacturer
2. Model
3. Modality
4. MAG\_DCMTOTGA.exe parameters
5. Case# lookup code
6. Data extraction code
7. Data extraction file
8. Imaging Service (RAD or CON)

#### 10.4.2.1 Parameters Numbers 1 through 3

The entry in Modality.DIC for this instrument will start with the manufacturer, model, and modality:

G.E. Medical Systems | LOGIQ 700 | US |

#### 10.4.2.2 Parameter Number 4, Image Processing

The value of this parameter is a string of codes that are used as parameters for the program that converts DICOM files to TARGA™ format.

See the VistA Imaging DICOM Installation Guide, Appendix B.4.2 for appropriate values.

#### 10.4.2.3 Parameter Number 5, Accession Number Lookup Routine

This parameter specifies the name of the routine that is invoked to extract the Accession Number from the data in the header of the image file.

See the VistA Imaging DICOM Installation Guide, Appendix B.4.2 for appropriate values.

#### 10.4.2.4 Parameter number 6, Data Extraction Routine

This parameter specifies the name of the routine that is invoked to extract and process data from the header of the image file for the diagnostic workstation.

Some commercial PACS place the proper value in the Accession Number field before sending the image to VistA.

See the VistA Imaging DICOM Installation Guide, Appendix B.4.2 for appropriate values.

#### 10.4.2.5 Parameter Number 7, Text Data Extraction Element List

This parameter specifies the name of the file that contains the list of DICOM elements passed to a diagnostic workstation.

See the VistA DICOM Installation Guide, Appendix B.4.2 for appropriate values

### 10.5 Loading data from Modality.DIC into VistA

The data in **Modality.DIC** must be loaded into the VistA Imaging DICOM Gateway via the corresponding master file build routine as described above in Section 6.3.4.

### 10.6 Setting up the MAG CT PARAMETER File for VistARad

The MAG CT PARAMETER File (#2006.621) is used to correct problems with Hounsfield Unit (HU) calculations on certain historical CT images that have been stored in the Targa (.tga) file format. The problem may occur for some images processed by a DICOM Gateway that was configured with incorrect or inconsistent DCM-to-TGA processing parameters for the CT device. VistARad Patch 65 (and subsequent versions) can compensate for the incorrect modality processing parameters to perform corrected Hounsfield calculations, provided that some parts of the processing parameters that were used can be determined. The MAG CT PARAMETER file provides a place to maintain a date-indexed history of the processing parameters for each CT device which the VistARad client software can use to apply the correction, if needed.

**Note:** Images that could potentially be affected by this problem include those from any CT that was processed by a DICOM gateway *prior* to the installation of Imaging DICOM Patch 50. Images processed after installation of Patch 50 (beginning with test build T29) are *not* subject to the problem; Patch 50 was released on July 13, 2006.

**Note:** If this problem occurs with images acquired with different CT models, the required fix must be implemented independently for each model.

The following sections explain how to verify if this problem exists and how to correct it. Note that to research the problem and apply the fix described below, you will need:

- Access to the DICOM Menu Options menu [MAGD DICOM MENU] on the VistA system.
- Access to the Imaging server/shares where images' associated text files are stored.
- An Imaging professional or support staff member with access to VistARad for viewing CT images and performing the Hounsfield measurement function.

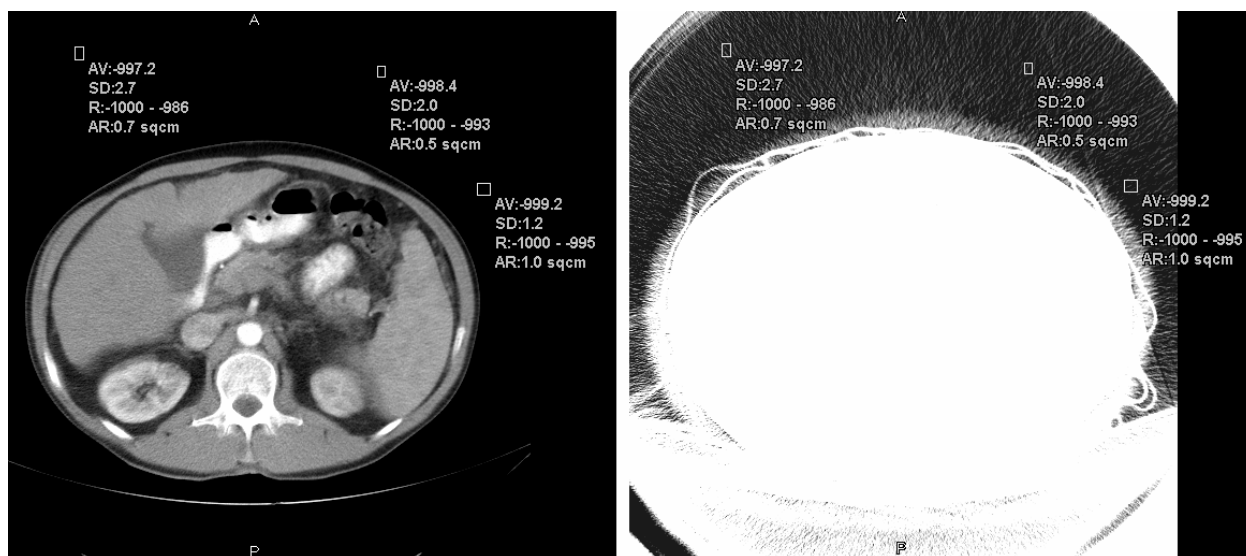
### 10.6.1 Verifying the CT HU Calculation Problem

One indicator of the problem may be noted when a standard CT preset is applied to a CT image, and the displayed image grayscale adjustment does not correspond to what a radiologist or imaging professional would “expect” to see (i.e. the relative gray values of different tissues do not appear correct). The other indicator of the problem is that Hounsfield measurements on the problem images will report obviously incorrect results—the incorrect measurements could be off by as little as 20 HU, or as much as 1024 HU.

A simple test to confirm that the problem exists is to perform a Hounsfield measurement of the air space captured in some images. To do this, the exam must have some images where the field of view includes some air space around the patient (i.e., between the patient and the wall of the scanner). Note that some exams (e.g., spines) do not have any air space, so these cannot be used to confirm the problem; most head or body CT exams will be useful for researching the problem.

After locating an appropriate exam, display the exam in VistARad. Using the Hounsfield measurement tool, perform a measurement on an image by selecting some air space outside the patient. Avoid blankets or clothing, etc., and be sure to measure only inside the circular region of the chamber—avoid the corners of the image, as most CT devices hard code dummy values in the corners.

**Tip:** Before using the Hounsfield measurement tool, adjust the window/level on the image to an extreme that reveals the air as gray, not black; the circular shape of the chamber should be clearly distinguishable. When selecting a region to measure, select the darkest portion of the air space. See the illustrations below that show the correct location of a Hounsfield measurement of air. One image shows a “normal” presentation, and the other illustrates how the “extreme” window/leveling can help locate the best locations for measuring the air space.



The actual HU value for air is -1,000 (minus 1,000). Perform several measurements on the image; if the Average measurements you obtain are more than 8 HU off from -1,000 (i.e., outside



the range -1,008 to -992), and the Range indicated does not show a low end almost exactly equal to -1,000, then the problem is in evidence.

The above examples show expected correct HU values—note the Average (AV:) and Range (R:) values for comparison.

### 10.6.2 Applying the Correction

If you have confirmed that the problem exists, then log a support request with National VistA Support (NVS)—specify “Need HU Calibration” in the Remedy ticket. NVS Imaging support staff will provide assistance in determining the correct parameters needed, and make sure that the time frames that need to be covered are correctly accounted for.

You will need to provide NVS with:

1. A sample image that exhibits the problem, with the corresponding .TXT file.
2. A screen dump from the VistA menu option MAGD DICOM MENU / Display MAGD CT PARAMETER entries for your location code.

NVS will provide to you the information needed to make appropriate entries to the MAG CT PARAMETER file.

### 10.7 Setting up the MAG CR PARAMETER File for VistARad

The MAG CR PARAMETER File (#2006.623) is used to correct measurement problems in images acquired by Fuji CRs using specific versions of the Flash IIP console software. The affected software versions (as indicated by Fuji) were:

A09-17	A11-18
A10-06	A11-21
A11-02	A11-22
A11-12	V1.0(B)
A11-15	V2.0(B)
A11-16	V3.0(B)
A11-17	

Fuji notified sites of this problem and took corrective action in May 2004. However, images acquired before the problem was fixed will continue to underreport measurements because of an incorrect value in their DICOM header (and associated text file).

**Note** If an intermediary device such as a DeJarnette ImageShare CR is present, affected images may be identified as being from the intermediary device, rather than from a Fuji device.

**Note** Sites running VistARad Patch 32 are not affected by this problem. However sites that use newer VistARad versions (18 and 65) will experience this problem because

newer versions of VistARad use the tag (Pixel Spacing (0018,1164)) that was incorrectly populated at acquisition.

The following sections explain how to verify if this problem exists and how to correct it. Note that to apply the fix described below, you will need:

- Access to the DICOM Menu Options menu [MAGD DICOM MENU] on the VistA system.
- Access to the Imaging server/shares where images' associated text files are stored.

### 10.7.1 Verifying the CR Measurement Problem

In VistARad Patch 18 and later, images with this problem will underreport length or area measurements by as much as 50%. If this is reported by users, locate and display the text file associated with the problematic image.

In the part of the file that contains the DICOM header information, locate the lines related to pixel spacing:

```
0018,1164|Imager Pixel Spacing^DS|1,1|0.10
...
0028,0030|Pixel Spacing^DS|1,1|0.20
```

If the values in each of these fields are the same, there is a different basis for the problem that will need to be determined (contact NVS if necessary). If the values for Imager Pixel Spacing and Pixel Spacing are different, use steps in the next section to correct the problem.

### 10.7.2 Applying the Correction

If it is not open already, open a text file from an image where you have verified that pixel spacing values are incorrect. Then identify the fields listed below (specific values may vary).

```
0008,0070|Manufacturer^LO|1,1|FUJI PHOTO FILM Co., ltd.
...
0008,1090|Manufacturer's Model Name^LO|1,1|5000
...
0018,1020|Software Version(s)^LO|1,1|A11-02
```

Use the Edit CR PARAMETER File [MAGD CR PARAMETER EDIT] option to update the MAG CR PARAMETER File (#2006.623) as shown below.

**Note:** Enter values exactly as they are shown in the text file. Be sure to use the same case, spaces, punctuation etc..

Select OPTION NAME: <b>MAGD CR</b>		
1	MAGD CR PARAMETER EDIT	Edit CR PARAMETER File

```

      2  MAGD CR PARAMETER INQUIRY          Display MAGD CR PARAMETER entries
CHOOSE 1-2: 1  MAGD CR PARAMETER EDIT      Edit CR PARAMETER File
Edit CR PARAMETER File

      ** Enter/Edit MAG CR PARAMETER data **

Select MAG CR PARAMETER LOCATION: 363  <division where images were acquired>
LOCATION: 363//
Select MANUFACTURER: FUJI//  FUJI PHOTO FILM Co., ltd.
  Are you adding ' FUJI PHOTO FILM Co., ltd.' as a new MANUFACTURER (the  2ND
for this MAG CR PARAMETER)? No// Y  (Yes)
    Select MODEL: 5000
  Are you adding '5000' as a new MODEL (the 1ST for this MANUFACTURER)? No// Y
(Yes)
    Select SOFTWARE VERSION: A11-02
  Are you adding 'A11-02' as a new SOFTWARE VERSION (the 1ST for this MODEL)?
No// Y  (Yes)
    USE OLD PIXEL SPACING VALUE: Y  YES
    Select SOFTWARE VERSION:
    Select MODEL:
    Select MANUFACTURER:

```

When you are finished, use VistARad to open the exam in question and make sure measurements are reported correctly.

**(end of Section)**

## Chapter 11 Diagnostic Tests

This chapter describes some simple diagnostic tests that are useful when troubleshooting a problem in an installation containing a VistA Imaging DICOM Gateway. (See the VistA Imaging DICOM Gateway Installation Guide for additional tests.)

### 11.1 PING

Probably the most useful command for network troubleshooting is PING, which, like the navy destroyers of old, listens for an echo response from its destination. The pinging of Forum, the VA email system, is shown below:

```
C:\> ping forum <Enter>
```

```
Pinging FORUM [11.22.33.44] with 32 bytes of data:
```

```
Reply from 11.22.33.44: bytes=32 time<10ms TTL=254
Reply from 11.22.33.44: bytes=32 time<10ms TTL=254
Reply from 11.22.33.44: bytes=32 time<10ms TTL=254
Reply from 11.22.33.44: bytes=32 time<10ms TTL=254
```

or

```
Request timed out.
Request timed out.
Request timed out.
Request timed out.
```

The above example shows the results of a successful and an unsuccessful PING. PING issued four “impc requests” and four (or zero) “impc responses” were received.

A system should always be able to ping its TCP/IP default gateway. A good initial test for physical network integrity is to try to ping the system’s default gateway.

**Note:** While most DICOM devices support PING in both directions, at least one commercial DICOM image acquisition device (the GE Digital Radiofluoro DRS 3.1) simulates a phony PING function by attempting to establish an FTP session with the destination system. This does not work with the VistA DICOM system, since Windows workstations do not normally provide an FTP server.

### 11.2 DICOM Echo

This program verifies that a connection can be made between the processor on which it is started and a DICOM compatible instrument on a specified network location. It is the most useful tool for testing DICOM application connectivity.

This program can be started from the MS-DOS prompt. The syntax to call the program is:  
> DICOM\_Echo <ip\_address> <port>

For example:

```
D:\>DICOM_Echo 127.0.0.1 60010 <Enter>
Echo context: Context
Verification Response
  Message ID Responded to:    1
  Verification Status:       0000
Echo Response
Message ID Responded To: 1
Data Set Type:             0101
Status:                    0000  Status Information:-
                          Successful operation
Class UID:                 1.2.840.10008.1.1

D:\>
```

When no connection can be established, the error message will look like:

```
D:\>DICOM_Echo 127.0.0.1 60010 <Enter>
Abnormal exit
  60012 TCP Initialization Error: Bad file descriptor
  130012 Peer aborted Association (or never connected)
  180012 Failed to establish association

D:\>
```

When troubleshooting any problem related to the communication between two DICOM-compatible instruments, the first step should always be to verify that PING works, and the second step should be to verify that the DICOM Echo works.

### 11.3 Sending a Test Image

Normally, the “instruments” send images. For testing or training purposes, it is convenient to transmit images at will. The utility program `Send_Image` transmits a specified image file to a designated storage server and can be used for testing.

This program can be started from the MS-DOS prompt. The syntax to call the program is:  
**> Send\_Image <ip\_address> <port> <image\_file> <image\_file> ...**

For example:

```
D:>Send_Image 127.0.0.1 60120 I:\samples\pacemkr.dcm <Enter>
Association accepted, parameters:
APP CTX NAME:1.2.840.10008.3.1.1.1
      Application Context Name, NEMA
AP TITLE:    DICOM_TEST
AP TITLE:    DICOM_STORAGE
AP TITLE:    DICOM_STORAGE
MAX PDU:     16384
Peer MAX PDU: 32768
PRES ADDR:   isw-de
PRES ADDR:   127.0.0.1:60120
REQ IMP UID: 1.2.840.113654.2.3.1995.2.10.0
```

```

Implementation Class UID, MIR
REQ VERSION:  MIRCTN03AUG98
ACC IMP UID:   1.2.840.113754.2.1.1.0
Unknown UID
ACC VERSION:  VA DICOM V2.5
Requested Presentation Ctx
  Context ID:      1
  Abstract Syntax:  1.2.840.10008.5.1.4.1.1.1
                   Computed Radiography Image Storage, NEMA
  Result field:    0
  Proposed SCU/SCP Role:  SCU
  Accepted SCU/SCP Role:  Default
  Proposed Xfer Syntax(es)
                   1.2.840.10008.1.2
                   Implicit Little-Endian Transfer Syntax, NEMA
  Accepted Xfer Syntax:
                   No UID
Accepted Presentation Ctx
  Context ID:      1
  Abstract Syntax:  1.2.840.10008.5.1.4.1.1.1
                   Computed Radiography Image Storage, NEMA
  Result field:    0
  Proposed SCU/SCP Role:  SCU
  Accepted SCU/SCP Role:  Default
  Proposed Xfer Syntax(es)
  Accepted Xfer Syntax: 1.2.840.10008.1.2
                   Implicit Little-Endian Transfer Syntax, NEMA
Initial call to sendCallback
    0 bytes transmitted of 6557696 (context string)
  16364 bytes transmitted of 6557696 (context string)
  32728 bytes transmitted of 6557696 (context string)
. . .
6545600 bytes transmitted of 6557696 (context string)
6556330 bytes transmitted of 6557696 (context string)
6557696 bytes transmitted of 6557696 (context string)
Store Response
Message ID Resp:1
Data Set Type: 0101
Status: 0000 Status Information:-
    Successful operation
Class UID: 1.2.840.10008.5.1.4.1.1.1
Instance UID: 1.3.46.670589.8.9221400214003.96.8.12.11.12.53.26711
Store Response
Message ID Resp:1
Data Set Type: 0101
Status: 0000 Status Information:-
    Successful operation
Class UID: 1.2.840.10008.5.1.4.1.1.1
Instance UID: 1.3.46.670589.8.9221400214003.96.8.12.11.12.53.26711
D:>

```

When the destination DICOM Storage Server is not running, the error message will look like:

```

D:>Send_Image 127.0.0.1 60120 I:\samples\pacemkr.dcm <Enter>
D:\edm\MAG 10:38:43>send_image 127.0.0.1 60120 i:\samples\pacemkr.dcm
Abnormal exit

```

```
60012 TCP Initialization Error: Bad file descriptor
130012 Peer aborted Association (or never connected)
180012 Failed to establish association
```

D:>

Sometimes it is necessary to transmit a set of images. A **FOR-LOOP** can be used with `Send_Image` for this purpose. The following steps describe one way to do this:

1. Create a temporary directory to contain the set of image.
2. Copy all of the images to the temporary directory.
3. Start a **CMD** session and **CD** to the temporary directory. You should have just the images that you want to send.
4. Run the following command line:

```
for %f in (*.dcm) do send_image <ip_address> <port> %f
```

This procedure will send each DICOM image in the directory to the Storage process running on the specified port of the system with the designated ip address.



# Chapter 12 Image Transfer from Commercial PACS - DICOM Exam Complete

This is the method used by the GEMS PACS when configured with the Mitra PACS Broker and by the EMED PACS.

## 12.1 Overview

The following sequence of messages and events are used in the commercial PACS interface (see Figure 12.1 below).

1. The Order Entry message is sent to the commercial PACS when the patient arrives in Radiology and the case number is assigned to the study. This also puts the imaging service request on the VistA Modality Worklist Provider.
2. The patient is moved to the image acquisition modality.
3. The image acquisition modality retrieves the information about the study from the VistA Modality Worklist.
4. The modality acquires the images and sends them to the commercial PACS.
5. The technologist performs CASE EDIT using the VistA Radiology package to mark the completion of the acquisition of the images. This information is conveyed to the PACS in the Exam Verification message (where it is usually ignored). The same event removes the imaging service request from the VistA Modality Worklist Provider.
6. The PACS sends the Exam Complete message to VistA when it is ready to transfer the images. At what time this occurs depends upon the commercial PACS implementation. The Exam Complete message contains the Study Instance UID (0020,000D) that is needed to retrieve the images.
7. The VistA DICOM Image Gateway issues a C-MOVE Request to initiate the transfer of copies of the images from the commercial PACS to the VistA DICOM Image Gateway.
8. The commercial PACS uses the MAG\_C-STORE service to transfer each image to the VistA DICOM Image Gateway.
9. The commercial PACS sends one or more C-MOVE Responses to the VistA DICOM Image Gateway. The last C-MOVE Response is required to complete the transfer operation. (Intermediate C-MOVE Responses are optional, and are used to provide progress information about the request.)

The detailed operation of steps 6-9 is presented in the following sections.

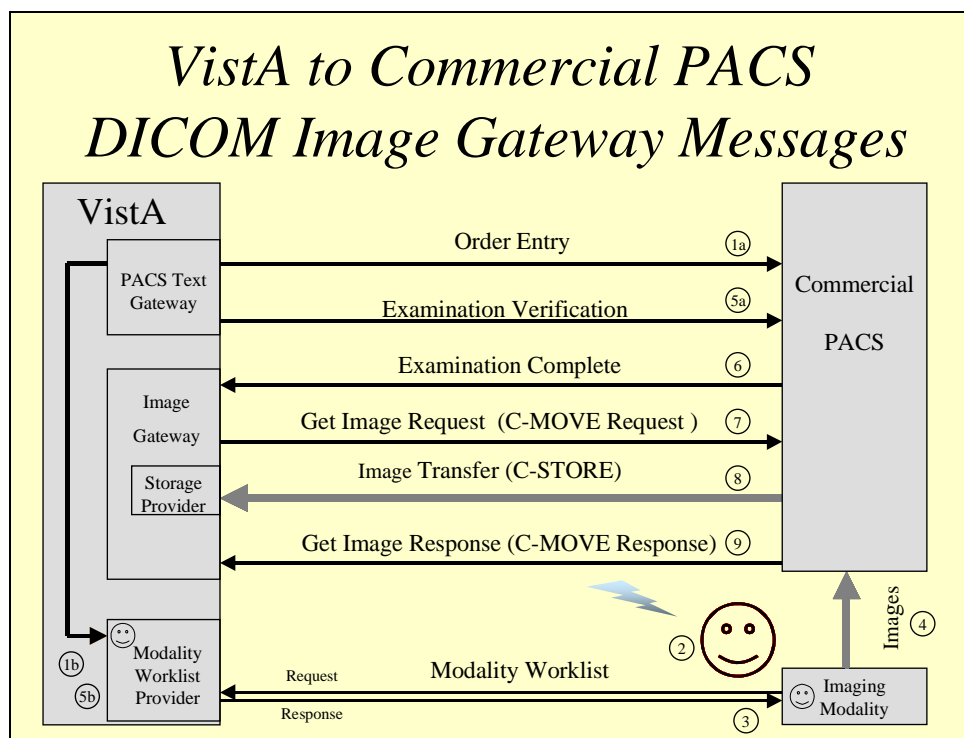


Figure 12.1

## 12.2 Query/Retrieve

Query/Retrieve is the name of a set of DICOM functions (SOP Classes) that are used to interrogate a DICOM image server for patient, study, and image text data, and to obtain images. In general, there are three separate DICOM services involved:

- C-FIND** Queries a DICOM server for information about stored objects. (Not used for this application, but needed for the ACR-NEMA protocol).
- C-MOVE** Requests a set of images to be transferred from one DICOM Application Entity to a DICOM Storage Application Entity.
- MAG\_C-STORE** Transfers images from one DICOM Application Entity to a DICOM Storage Application Entity.

With the VistA – commercial PACS interface, the first service is not necessary, since the Exam Complete message provides the Study Instance UID.

Image retrieval is then a two-step process combining the last two services. The Study Instance UID from the Exam Complete message is used to specify in a **C-MOVE** request the set of images to be transferred to a designated storage application entity, and then the images are transferred using **MAG\_C-STORE**.

### 12.3 VistA DICOM Image Gateway Processes

Five window processes need to run on a VistA DICOM Image Gateway in order to receive images from a commercial PACS:

1. Receive Exam Complete – listener process that accepts Exam Complete messages sent by the commercial PACS
2. Request Image Transfer – sends the C-MOVE request to the commercial PACS and receives and handles the C-MOVE response messages from the commercial PACS
3. MAG\_C-STORE Provider – receives the images from the commercial PACS
4. Process DICOM Images – creates the association between study in the main patient record database and corresponding images; stores the images on the file server
5. Imaging Status – provides up-to-date statistics on the entire sequence of processes

### 12.4 Configuration Preparation for PACS Interface

#### 12.4.1 Gateway Parameters for PACS

The VistA DICOM Image Gateway parameters must be configured to handle transmission of images from the commercial PACS. On the “System Maintenance” menu, “Gateway Configuration and DICOM Master Files” submenu, select the “Update Gateway Configuration Parameters” option. Answer the following two questions as shown:

Is a PACS going to send Exam Complete messages to VistA? YES// Y

Select the kind of commercial PACS at this site

-----

- 1 - GE Medical Systems PACS with Mitra PACS Broker
- 2 - GE Medical Systems PACS with ACR-NEMA Text Gateway
- 3 - eMed Technology Corporation PACS
- 4 - Other commercial PACS

What kind of a PACS? 2// 1 GE Medical Systems PACS with Mitra PACS Broker

This will enable the “Receive PACS Exam Complete Messages” and “Send PACS Request Image Transfer Messages” options on the “Image Gateway” menu.

#### 12.4.2 Receive Exam Complete Messages

Create an entry in the **F:\DICOM\Dict\Portlist.DIC** master file to designate the port on which the VistA DICOM Image Gateway will receive Exam Complete messages.

The port number in such an entry should be 60041. The entry in the Portlist.DIC should look as follows:

```
#Menu Option|AE Title|Port|File Mode (FIFO QUEUE or DIRECT)|CHANNEL
Exam Complete|Vista_PACS_IF|60041|DIRECT|1
```

Notify the commercial PACS personnel that they must create an entry on their system to send the Exam Complete messages to:

- AE Title: “**VISTA\_PACS\_IF**”
- IP-Address: address of the VistA DICOM Image Gateway
- Port number: 60041

### 12.4.3 C-STORE Provider

Create an entry for the PACS in the **F:\DICOM\Dict\Instrument.DIC** master file to designate the port on the VistA DICOM Image Gateway for receiving images.

Select a convenient image acquisition port number (that is, 60100-60999, or possibly 104). The recommended abbreviation for this C-STORE Provider is “**PACS**”. Create the associated shortcut to `MAG_cstore.exe`.

Notify the commercial PACS personnel that they must create an entry on their system to send images to...

- AE Title: “**VISTA\_STORAGE**”
- IP-Address: address of the VistA DICOM Image Gateway
- Port number: 60nnn (or 104)

### 12.4.4 Send PACS Request Image Transfer Messages

Create an entry for the PACS in the **F:\DICOM\Dict\SCU\_List.DIC** master file to designate the IP address, port number, and application entity title on the commercial PACS for the C-MOVE requests send by VistA.

The entry must have the name **PACS QUERY/RETRIEVE**.

Example:

```
# User Application List
# Format:
# line 1:Application Name|Called AET|Calling AET|Destination IP Address|Port
# line 2:|Presentation Context Name|Transfer Syntax Name
# line 3:| |Transfer Syntax Name (if there are more than one)
#
PACS Query/Retrieve|QueryRetrieve|VISTA_QR_SCU|111.222.333.444|104
|Verification SOP Class|Implicit VR Little Endian
|Study Root Query/Retrieve Information Model - FIND|Implicit VR Little Endian
|Study Root Query/Retrieve Information Model - MOVE|Implicit VR Little Endian
# End of File
```

Note that the Called Application Entity Title, Destination IP Address and Port Number are obtained from the commercial PACS vendor. The Calling Application Entity Title must be **Vista\_QR\_SCU**.

Observe also that the “Study Root Query/Retrieve Information Model – **FIND**” is included in the presentation context name list. (It is needed for future applications.)

### 12.4.5 Process DICOM Images

No additional setup required.

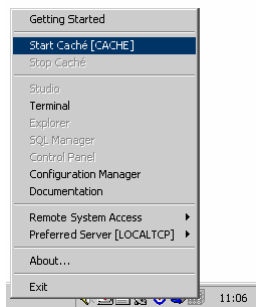
### 12.4.6 Display Real-Time Storage Server Statistics

No additional setup required.

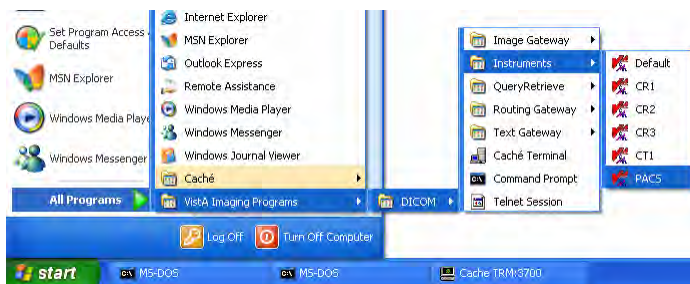
## 12.5 Startup Sequence for Commercial PACS Interface

Use the following sequence of steps to start the VistA DICOM Image Gateway for the commercial PACS:

1. Make sure that the Caché Server is running (the Caché Cube should be blue). If the cube is grey, right-click on it, and select Start Caché.

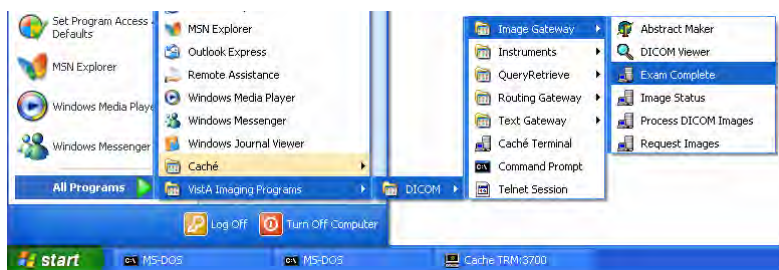


2. From the Windows Start Menu, select the C-Store program for the application labeled PACS (start at the **Start** Button, then navigate to **All Programs** → **VistA Imaging Programs** → **DICOM** → **Instruments** → **PACS**).

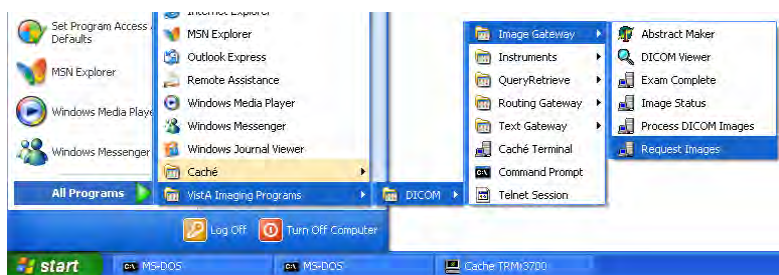


If a session is running the application that displays current activity logs, some activity should be visible in the window for that session.

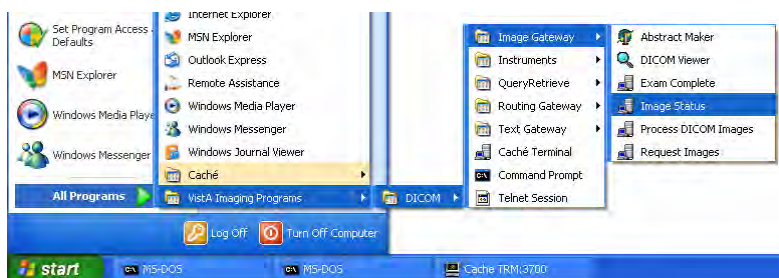
- From the Windows Start Menu, select the telnet session for the application that processes Exam Complete Messages (start at the **Start Button**, then navigate to **All Programs → Vista Imaging Programs → DICOM → Image Gateway → Exam Complete**).



- From the Windows Start Menu, select the telnet session for the application that requests Images from the PACS (start at the **Start Button**, then navigate to **All Programs → Vista Imaging Programs → DICOM → Image Gateway → Request Images**).



- From the Windows Start Menu, select the telnet session for the application that displays the status of Image Processing (start at the **Start Button**, then navigate to **All Programs → Vista Imaging Programs → DICOM → Image Gateway → Image Status**).



## Chapter 13 Autorouting Images from PACS to VistA

Some commercial PACS (like AGFA, BRIT, and KODAK CEMAX-ICON) automatically route all images to VistA and do not use the Exam Complete message and Query/Retrieve C-MOVE service described in Chapter 12.

The VistA interface for these PACS is simpler to setup and easier to operate. The commercial PACS looks like a single image acquisition modality to VistA, albeit a prolific one.

### 13.1 Configuration Preparation for PACS Interface

#### 13.1.1 Gateway Parameters

The VistA DICOM Image Gateway parameters must be configured to handle transmission of images from the commercial PACS. On the “System Maintenance” menu, “Gateway Configuration and DICOM Master Files” submenu, select the “Update Gateway Configuration Parameters” option. Answer “NO” to the following question:

Is a PACS going to send Exam Complete messages to VistA? NO

This will disable the “Receive PACS Exam Complete Messages” and “Send PACS Request Image Transfer Messages” options on the “Image Gateway” menu.

#### 13.1.2 C-STORE Provider

Create an entry for the PACS in the **F:\DICOM\Dict\Instrument.DIC** master file to designate the port on the VistA DICOM Image Gateway for receiving images.

Select a convenient image acquisition port number (that is, 60100-60999, or possibly 104). The recommended abbreviation for this C-STORE Provider is “**PACS**”. Create the associated shortcut to **MAG\_cstore.exe**.

Notify the commercial PACS personnel that they must create an entry on their system to send images to:

- AE Title: “**VISTA\_STORAGE**”
- IP-Address: address of the VistA DICOM Image Gateway
- Port number: 60nnn (or 104)

### 13.2 Startup Sequence for commercial PACS

The startup of the VistA DICOM Image Gateway is exactly the same as that for an image acquisition modality interface.

**(end of Section)**



# Chapter 14    VistA DICOM Interface for Healthcare Providers Operation

## 14.1    Introduction

DICOM was developed for radiology and was first supported for that service. The VistA DICOM Interface for Healthcare Providers supports image acquisition devices in the clinical specialties outside of radiology. It is a bi-directional interface that allows the image acquisition device to download patient and study information from CPRS Consults Request Tracking and to upload images to VistA, where they are automatically associated with the corresponding patient consult or procedure request and stored in the multimedia database.

The VistA DICOM Interface for Healthcare Providers uses CPRS Consult Request Tracking and the Appointment/Scheduling module of the Patient Information Management System (PIMS) to pass data to the DICOM Text Gateway. Each image acquisition device downloads the patient name, patient id, and accession number from the DICOM Text Gateway, and stores them in the header of every image. When the gateway receives the images, it uses these three values to identify the patient and the corresponding consult or procedure request. The gateway then links the images to the most recent TIU note for the request. If a TIU note is not present at that moment, the application waits for it to be generated and links the images to it when it is created. The interface is totally automatic and completely transparent to the CPRS user.

The DICOM interface supports CPRS Consults, Procedures and Clinical Procedures, but not Progress Notes.

## 14.2    Workflow for the Healthcare Providers

The CPRS Consult Request Tracking application is used in the clinical specialties for order entry, request tracking, and result reporting. The PIMS Scheduling/Appointment module (which is separate from CPRS) is used for scheduling clinic visits. The following steps are performed for both consult and procedure requests:

1. The clinician enters an order for a consultation, a procedure, or a clinical procedure.
  - a. The consult service gets notified about the request.
  - b. The consult service may accept the request with notification sent back to the patient's clinician.
  - c. Alternatively, the consult service may forward the request to a different service; or
  - d. The consult service can discontinue or cancel the request.
2. The consult service schedules an appointment for the patient.
3. The consult service checks the patient in when the patient arrives for the appointment.

4. The patient arrives at the image acquisition workstation
5. The technologist at the image acquisition workstation uses Modality Worklist to download patient and study information to the workstation.
6. The technologist acquires the images from the patient and sends them to VistA
7. The technologist verifies that the images are correctly associated with the patient's study on VistA
8. The patient leaves the image acquisition workstation. The consult service checks the patient out when s/he leaves.
9. The specialist performs a diagnostic reading of the images
10. The diagnostic report is entered
11. The consult request is completed by electronic signing the report
12. Clinicians review the diagnostic report and the images.

There is quite a bit of flexibility for different workflow scenarios. Some of the CPRS steps can be omitted and all of the PIMS Scheduling/Appointment module messages are optional. It is absolutely essential, however, to complete each CPRS consult/procedure request by entering a signed TIU result note. Otherwise, the images will be not properly associated and the request will remain on the worklist.

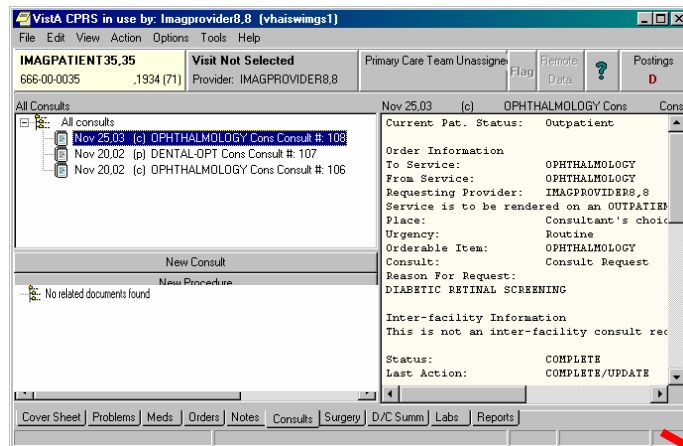
### **14.3 DICOM Modality Worklist for Healthcare Providers**

The VistA DICOM Text Gateway supports a DICOM service called Modality Worklist, which is used to pass patient demographics and ordering information to the image acquisition device. All new DICOM image acquisition devices (that is, the modalities) are required by the VA to support the Modality Worklist service and be able to automatically download selected patient and study information. The DICOM interface receives information from the CPRS Consult/Procedure Request Tracking application and the VistA Appointment Management package during various steps of the workflow. The ordering, accepting, scheduling, check-in, and result entry steps in the workflow are used to create and update the Modality Worklist database, while the consult/procedure completion step causes entries to be deleted.

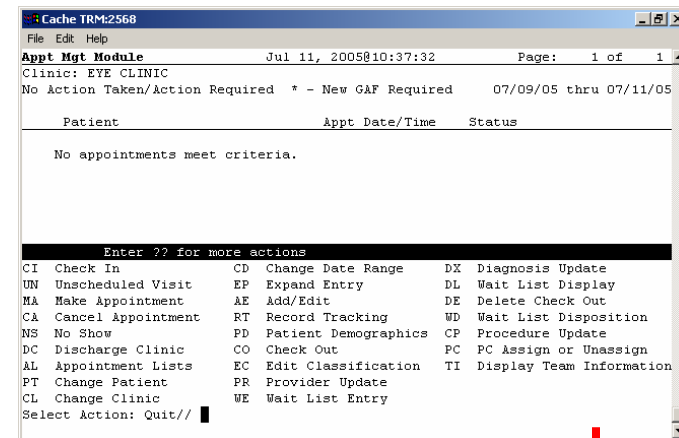
#### **14.3.1 Obtaining Information for the Modality Worklist Database**

The DICOM interface assumes that each clinical specialty uses the CPRS Consult Request Tracking package to manage consult and procedure workflow, and uses the VistA Appointment Management package to handle scheduling details (see Figure 14.1 below). Information about the request (patient demographics, ordering details -- why is the consult or procedure ordered, what service will perform the request, etc.) flows from the CPRS Consult Request Tracking package to the VistA DICOM Text Gateway. Similarly, scheduling information (when will the request will be performed and in which clinic) is sent from the Appointment Management package to the VistA DICOM Text Gateway.

## CPRS Consult Request



## VistA Appointment



**Figure 14.1 – Two Inputs to DICOM Gateway**

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### 14.3.2 Image Acquisition Devices Queries the Modality Worklist

The image acquisition device queries the DICOM Text Gateway to obtain information about the patients and studies that are currently active (see Figure 14.2 below). This information is then stored in the DICOM objects generated by the image acquisition device.

A broad modality worklist query produces a list for all the pending and scheduled consults and procedures for that clinical specialty. The DICOM Text Gateway also supports a “Quick PID” patient query, which may be more useful. This is a hash index, which uses an abbreviated identifier consisting of the first letter of the last name followed by the last four digits of the social security number (for example, K1234). This value is then used in either the Patient Name or Patient ID matching key to retrieve all of the consult/procedure requests for the patient. Using “Quick PID” is the fastest and most reliable way to obtain this data.

The internal entry number (IEN) of the consult or procedure request is used as the accession number. The accession number identifies the consult/procedure and is displayed on the CPRS screen with the request. This value can be used in either the Accession Number or Requested Procedure ID matching key to retrieve the specific request. (This is more useful for radiology than the clinical specialties, however.)



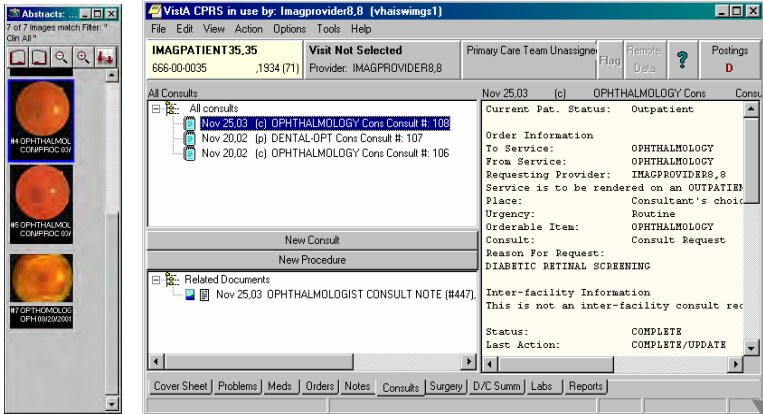
**Figure 14.2 – Modality Worklist Query**

### 14.4 Image Acquisition and Association

When images are acquired by the modality and are sent to VistA, they are associated with the corresponding CPRS consult or procedure request and are stored on VistA (see Figure 14.3 below). The images are attached to the most recent TIU result note for the request. If no TIU result note exists, the images are placed in a temporary file until the result note is entered. The images are then attached to the first TIU result that is entered.

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### CPRS Consult Request



### VistA Appointment

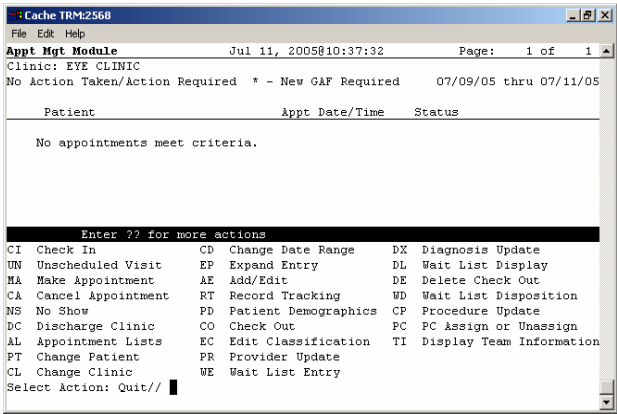


Figure 14.3 – Image Acquisition

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### **14.5 Image Verification**

After the images have been acquired and sent to VistA, the technologist should view the images using the VistA Imaging Display application (see Figure 4 below). The ICON on the CPRS note will not be present because a result has not yet been entered.

The technologist should verify that all the images that were acquired are present on VistA, that they are displayed properly, that they are the correct images, and that there are no unexpected additions (that is, images from another patient).

The patient should be allowed to leave the image acquisition device only after the technologist has successfully verified the images.

### **14.6 Entering a TIU Result Note and Completing the Consult**

The specialist should perform a diagnostic interpretation of the images, enter the TIU result note, and complete the consult by electronically signing it. These two steps are necessary for the proper operation of the interface. The images are permanently linked to the TIU result note so that they can be viewed from the CPRS Consult tab. Completing the consult removes the request from the Modality Worklist.

### **14.7 Viewing Images**

Images can be viewed from the VistA Imaging Display application (see Figure 14.4 below). After a TIU result note is entered for the consult/procedure, they can also be viewed from the CPRS Consult tab. (Until the TIU result note is entered, this capability is not supported.)

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# CPRS Consult Request Tracking

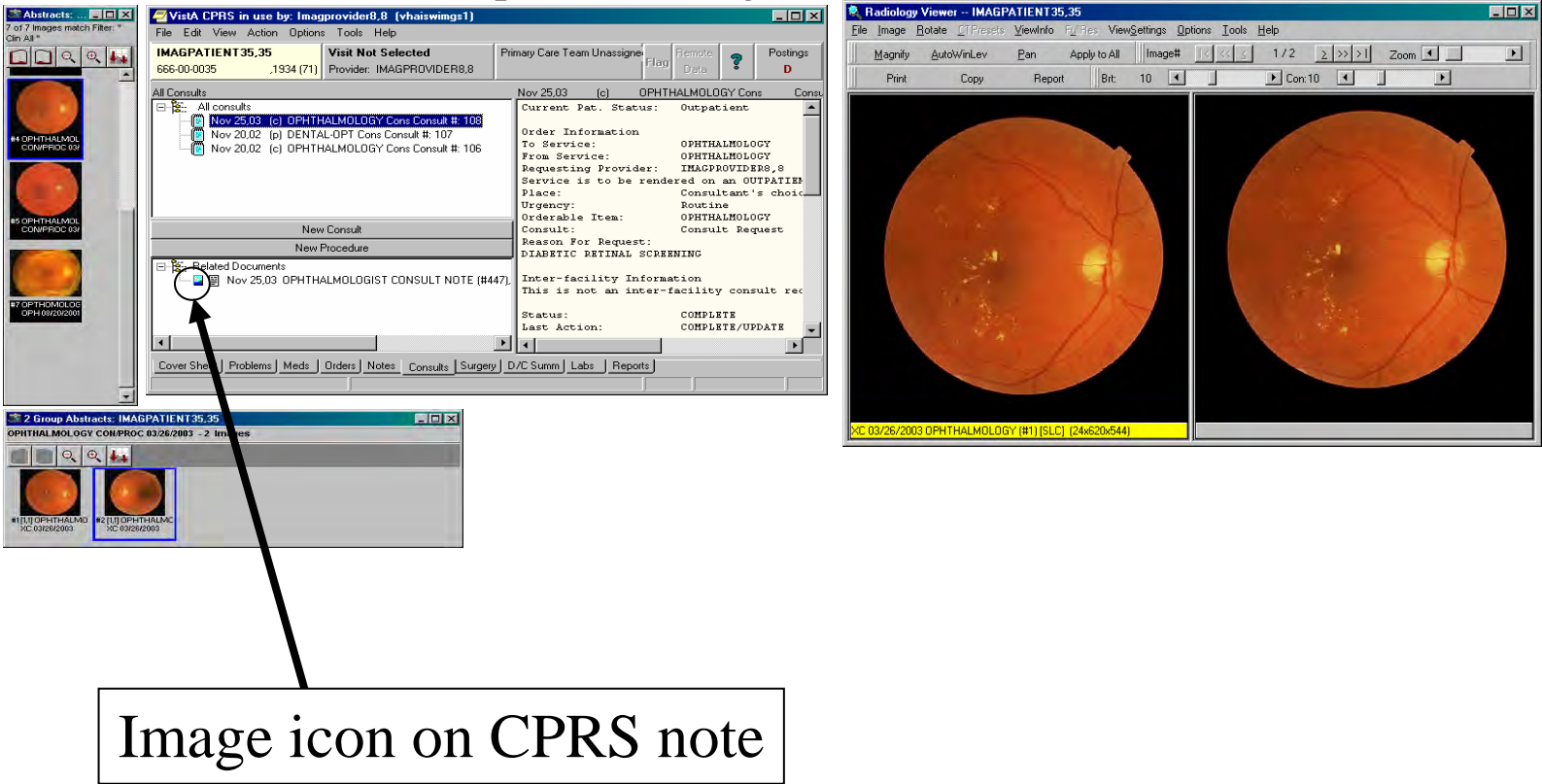


Image icon on CPRS note

Figure 14.4 – Viewing Images

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## 14.8 Handling Follow-up Visits

There is a requirement on follow-up visits to acquire additional images for the original request but to keep them separate from those obtained earlier. Since the consult was most likely already completed and the worklist entry was deleted, this almost always requires the modality worklist entry to be recreated in order for additional images to be entered. This can be accomplished by entering an unsigned TIU result note to re-open the request. Images that are subsequently acquired are associated with this TIU result note. Signing this TIU result note “completes the request again” and removes it from the worklist.

This process can be repeated any number of times. The images that are acquired are always associated with the most recently opened TIU result note.

## 14.9 Listing of Unread Studies

The List Unread Studies [MAGD LIST UNREAD STUDIES] option on the VistA HIS can be used to provide a listing of the CPRS consult and procedure requests for which images have been acquired but have not yet been resulted. See Section 14.6 above about resulting and completing consults requests.

UNREAD LIST FOR HEALTHCARE PROVIDERS

- 1) 660 -- SALT LAKE CITY -- OPHTHALMOLOGY
- 2) 660 -- SALT LAKE CITY -- DENTISTRY
- 3) 688 -- WASHINGTON, DC -- CRITICAL CARE, MED

Select the proper service (1-3) or enter ALL: 1

Display studies older than how many days? 0// 10

Sort by patient name or examination date? (N or D) D// n

DEVICE: HOME// TELNET

Building.....

UNREAD LIST FOR HEALTHCARE PROVIDERS

AUG 19, 2003@10:00:10

660 -- SALT LAKE CITY -- OPHTHALMOLOGY

Studies more than 10 days old sorted by name

IMAGPATIENT,ONE	000-84-4831	(MALE)	1929	
NOV 12,02 (a)	OPHTHALMOLOGY	Consult #100		Exam: NOV 12,02
NOV 12,02 (a)	OPHTHALMOLOGY	Consult #100		Exam: NOV 12,02
IMAGPATIENT,TWO	000-67-1123	(MALE)	1919	
MAR 27,03 (p)	OPHTHALMOLOGY	Consult #125		Exam: MAR 27,03
JUN 30,03 (p)	OPHTHALMOLOGY	Consult #145		Exam: JUN 30,03
IMAGPATIENT,THREE	000-02-6001	(MALE)	1936	
JUN 20,03 (pr)	OPHTHALMOLOGY	Consult #142		Exam: JUN 20,03
JUN 20,03 (pr)	OPHTHALMOLOGY	Consult #143		Exam: JUN 20,03
IMAGPATIENT,FOUR	000-05-2361	(MALE)	1896	
MAY 27,03 (p)	OPHTHALMOLOGY	Consult #137		Exam: MAY 27,03
IMAGPATIENT,FIVE	000-91-9678	(MALE)	1932	
NOV 14,02 (p)	OPHTHALMOLOGY	Consult #101		Exam: JUN 13,03

**(end of Section)**

# Glossary

Annotation	The ability to attach notes to images.
Architecture	The design of the components of a computer, network, or software system.
Archive	The long-term storage of data or images.
Audit trail	Record of activity on a particular file or computer.
Background processing	Simultaneous running of a “job” on a computer while working on another job. Examples would be printing one document while working on another, or the software may do automatic saves while you are working on something else.
BLOB	Stands for Binary Large Object and refers to the non-textual elements of a mail message.
Brightness	The balance of light and dark shades in an image.
Composite video	TV signal which sends all colors, and vertical and horizontal signals together.
Contrast	Range between the lightest and darkest tones in an image.
Density	The degree of darkness in an image.
DHCP	Decentralized Hospital Computer Program the earlier name of the VA's hospital information system, now called VistA.
DICOM	Digital Imaging and Communications in Medicine. A medical imaging standard, DICOM is standard for Radiology equipment and is being adopted by the other members of the medical imaging community.
Digital camera	A camera that transforms a picture into a system of numbers. The picture can then be manipulated pixel (dot) by pixel, and stored and transmitted in the manner as textual data.
File	All the data that describes a document or image.
File protection	Techniques for preventing files from being erased.
File server	A machine where shared software is stored.

Frame grabber	A device that changes a video picture into a digital computer language.
Gray scale	The range of shades of black in an image. The more shades recognized by the device, the clearer and sharper the image will be.
High resolution	Refers to a better quality of display over the original achieved by increasing the number of pixels (dots) per inch.
Hot spot	The single pixel that is activated by selection using a mouse, light pen, or other means.
Image	The computerized representation of a picture, or graphic.
Image abstract	A “thumbnail” version of an image, which requires less computer processing resources to display than the actual image.
Image group	A group of images associated with a medical examination.
Image processing	The translation of an image into a digital computer language so that it may be manipulated in size, color, clarity, or to enhance portions of it.
Image resolution	The fineness or coarseness of an image.
Imaging system	Collection of units that work together to capture and recreate images.
Jitter	The flickering of a displayed image.
Jukebox	A device that holds multiple optical discs and can swap them in and out of the drive as needed.
Login (Logon)	Procedure for gaining access to the system or program.
Multimedia	Combining more than one media for the dissemination of information (i.e., text, graphics, full video motion, audio).
On-line	Something that is available for access on the system.
Optical disc	A direct access storage device that is written to and read by laser light. Optical discs have greater storage capacity than magnetic media. Many optical discs are Write Once Read Many (WORM).



Pan	To view different parts of the image that extend beyond the borders of the screen.
Pixel	The individual dots that define a picture.
Resolution	Measure of output quality (dpi—dots per inch) or halftone quality (lpi—lines per inch).
Retrieval	The ability to search for, select, and display a document or image from storage.
RGB	Red, Green, Blue. The colors used in varying combinations and intensities on monitors, TV screens, etc.
Scaling	Uniformly changing the size of an image.
Scanner	A device that converts a hardcopy image into machine-readable code.
Server	A computer which is dedicated to one task.
Storage media	The physical device onto which data is recorded.
TWAIN	An interface standard for scanners, cameras and other input devices.
User preferences	The preferences that each user sets in the User Preferences window that control the circumstances and ways in which the Imaging package displays images.
Video camera	Camera which records full motion video.
Video digitizer	A device that changes a video picture into a digital computer language.
VistA	<u>V</u> eterans Health <u>I</u> nformation <u>S</u> ystem <u>T</u> echnology <u>A</u> rchitecture. VistA replaces DHCP.
Workstation	A computer that is dedicated to a single type of task.
Write Once Read Many (WORM)	Once written to the disc, data is only available for reading and cannot be altered.
Zoom	To enlarge an image or a portion of an image.



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